



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

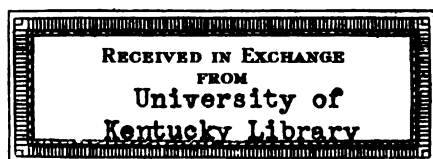
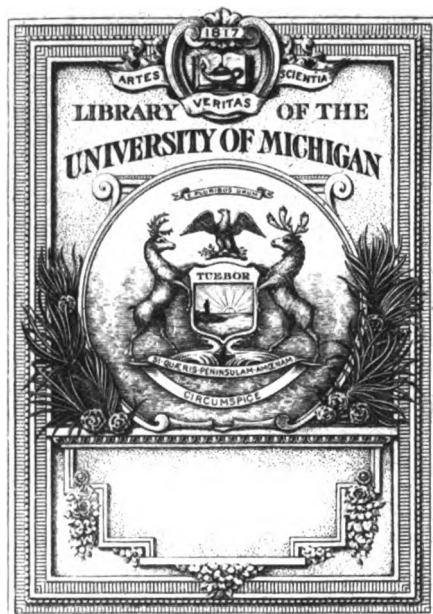
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

BUHR B



a39015 00012121



Forestry

SD

11

R3

A3

~~KY.~~
~~STATE~~
~~LIBRARY.~~

U.S. Bureau of Reclamation

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, SECRETARY

EIGHTEENTH ANNUAL REPORT
OF THE
RECLAMATION SERVICE
1918-1919

ARTHUR P. DAVIS
Director and Chief Engineer



WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

ANNUAL REPORTS OF THE RECLAMATION SERVICE.

[Reports may be purchased from Superintendent of Documents, Government Printing Office, at the prices given.]

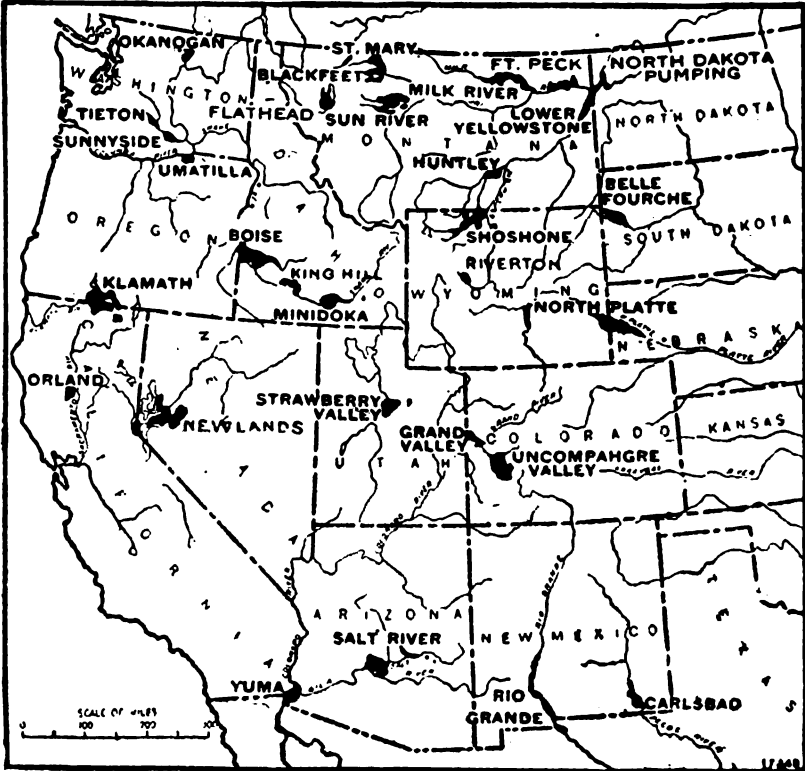
-
- I. June 17 to Dec. 1, 1902; 317 pages, 46 plates, 65 figures, case of drawings. Out of print.
 - II. Through the field season of 1903; 550 pages, 49 plates, 56 figures. Cloth, 85 cents.
 - III. Through the field season of 1904; 653 pages, 59 plates, case of drawings. Cloth, \$1.25.
 - IV. Through the field season of 1905; 374 pages, 63 plates. Paper, 80 cents.
 - V. Fiscal year 1905-6; 312 pages, 101 plates, 2 figures. Cloth, \$1.25.
 - VI. Fiscal year 1906-7; 287 pages. Paper, 25 cents.
 - VII. Fiscal year 1907-8; 219 pages. Paper, 25 cents.
 - VIII. Fiscal year 1908-9; 222 pages. Cloth, 40 cents; paper, 20 cents.
 - IX. Fiscal year 1909-10; 329 pages. (Includes history of construction to date.) Cloth, 40 cents; paper, 25 cents.
 - X. Fiscal year 1910-11; 290 pages. (Includes index Vols, I-X.) Cloth, 40 cents; paper, 25 cents.
 - XI. Fiscal year 1911-12; 310 pages, map. Cloth, 40 cents; paper, 25 cents.
 - XII. Fiscal year 1912-13; 382 pages. Cloth, 40 cents; paper, 25 cents.
 - XIII. Fiscal year 1913-14; 514 pages. Cloth, 45 cents; paper, 30 cents.
 - XIV. Fiscal year 1914-15; 521 pages. Cloth, 45 cents; paper, 30 cents.
 - XV. Fiscal year 1915-16; 808 pages. Cloth, 75 cents; paper, 60 cents.
 - XVI. Fiscal year 1916-17; 598 pages. Cloth, 65 cents; paper, 50 cents.
 - XVII. Fiscal year 1917-18; 552 pages. Cloth, 70 cents; paper, 50 cents.
 - XVIII. Fiscal year 1918-19; 560 pages. Cloth, 80 cents; paper, 60 cents.

A price list of publications issued by the Reclamation Service can be obtained by application to the Director and Chief Engineer, United States Reclamation Service, Washington, D. C.

The monthly bulletin of the service, the "Reclamation Record," is issued about the first of each month. It contains usually 48 pages of general news and notes of interest about the projects. The subscription price to others than water users is 50 cents per year, payable in advance. The publication is free to water users.

CONTENTS.

	Page
Letters of transmittal.....	5
General discussion.....	7
Development of reclamation projects.....	7
Drainage.....	27
Power development.....	29
Cement-testing work.....	38
Purchase of material and supplies.....	39
Freight, passenger, and express transportation.....	40
Legal division.....	40
Personnel.....	41
Finances.....	42
Discussion of projects.....	77
Primary projects.....	77
Secondary projects.....	383
Indian projects.....	434
Appendix.....	459
Index.....	557



PRINCIPAL RECLAMATION SERVICE PROJECTS IN THE WESTERN UNITED STATES.

LETTERS OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
Washington, December 5, 1919.

SIR: In compliance with the provisions of section 2 of the act approved June 17, 1902, entitled "An act appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands," I have the honor to transmit the Eighteenth Annual Report of the Reclamation Service.

Respectfully,

FRANKLIN K. LANE, *Secretary.*

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEPARTMENT OF THE INTERIOR,
UNITED STATES RECLAMATION SERVICE,
Washington, D. C., September 10, 1919.

SIR: Transmitted herewith is the Eighteenth Annual Report of the Reclamation Service, covering the work completed and in progress during the fiscal year ended June 30, 1919.

Very respectfully,

A. P. DAVIS,
Director and Chief Engineer.

The SECRETARY OF THE INTERIOR.

EIGHTEENTH ANNUAL REPORT OF THE RECLAMATION SERVICE.

GENERAL DISCUSSION.

DEVELOPMENT OF RECLAMATION PROJECTS.

It is now 17 years since the passage of the reclamation act, during which the surveys, examinations, and construction therein authorized have proceeded under the provisions of that act and other acts amendatory thereof and supplementary thereto. During the present year the service is in position to deliver water to about 1,600,000 acres of irrigable land, covered by crop census, of which about 1,120,000 acres are now being irrigated. Besides this storage water is delivered from permanent reservoirs under special contracts to about 950,000 acres more. The projects that have been undertaken have been planned to provide for an area of about 3,200,000 acres. This latter figure is tentative and subject to variation in accordance with the development of plans as the work progresses.

DROUGHT CONDITIONS.

A large portion of the arid region has been subject to severe drought for the past two years, leading to heavy losses on the part of those attempting to cultivate the soil without irrigation and leading to shortage of water supply in many irrigated regions. The reclamation projects have been remarkably free from drought conditions, owing to the ample storage provisions usually made, the only notable exception being a small project in northern Washington where the drought conditions are so intense that shortage has been suffered on a few thousand acres of irrigated land. The general requirement for irrigation, together with the striking success of agriculture under the Government projects, has greatly stimulated the demands for extension and completion of existing projects and the construction of new ones.

INVESTIGATIONS OF NEW PROJECTS.

Investigations have indicated the feasibility of many large projects in various parts of the West. Many of these, however, require far more work in surveys and estimates to make them available for construction, and liberal appropriations have been made by various States for this purpose, frequently on the condition that an equal amount of money be advanced for the same purpose by the General Government. The major portion of the investigation work now carried on by this service is expended under such contracts, the local contribution being made in some cases by the States and in others by voluntary associations.

Projects and extensions of projects investigated by the Reclamation Service in the Western States.

State and project.	Irrigable acreage.			Mean altitude.	Mean rain fall.	Probable cost. ¹	Readiness for construction.
	Public.	Private.	State.				
Arizona:				<i>Feet.</i>	<i>Inches.</i>		
Yuma Mesa.....	33,000	8,000	4,000	180	8	\$7,500,000	Ready.
San Carlos.....	\$40,000	30,000		1,500	10	13,600,000	Not ready.
California:							
Imperial Valley.....	400,000			—200	3½	52,000,000	Ready.
Palo Verde.....		40,000		250	3	5,000,000	Not ready.
Turlock-Modesto.....		260,000		95	12	5,000,000	Do.
King's River.....		400,000		225	10	12,000,000	Do.
Orland extension.....		30,000		245	18	2,500,000	Ready.
Iron Canyon.....		250,000		230	17	35,000,000	Not ready.
Colorado:							
Grand Valley.....	15,000	15,000		4,825	8	600,000	Ready.
Grand Valley drainage.....		30,000		4,650	8	1,200,000	Do.
Orchard Mesa.....		9,700		4,750	8	800,000	Do.
Uncompahgre.....	10,000	37,000		5,500	9½	500,000	Do.
Montezuma.....		42,000	8,000	5,900	12	3,500,000	Not ready.
San Luis Valley drainage.....		400,000		7,600	7	10,000,000	Ready.
Idaho:							
Hillcrest.....	3,000	10,000	1,000	2,800	13	700,000	Do.
Black Canyon.....	3,000	35,000	1,000	2,400	12	2,000,000	Do.
Minidoka.....	95,500	250	6,750	4,300	12½	15,000,000	Not ready
Hansen Butte.....		22,000		4,150	11	2,000,000	Ready.
Gem District.....		27,000		2,350	12	750,000	Do.
Lake Walcott.....	2,480		20	4,400	12½	215,000	Do.
American Falls Reservoir.....	\$33,000	33,000		4,300		12,000,000	Not ready.
Island Park Reservoir.....	\$10,700	5,000		6,250	15	4,000,000	Ready.
Boise valley drainage.....		30,000		2,500	12½	600,000	Do.
Payette Valley drainage.....		10,000		2,250	11½	180,000	Do.
Montana:							
Milk River—							
Chinook Division.....		50,000					Not ready.
Beaver Creek Division.....	10,000		708	2,200	14	1,700,000	Ready.
Cut Bank.....	\$25,000	11,000		3,800	13	1,200,000	Not ready.
Sun River.....	35,000	30,000		4,100	11	4,000,000	Ready.
Bitter Root.....		30,000		3,450	11	1,500,000	Not ready.
Nebraska:							
North Platte extensions.....	65,000	88,000	10,000	4,100	13	9,000,000	Ready.
Dawson County.....		45,000		2,700	22	2,500,000	Not ready.
Farmers Canal.....		50,000		2,600	22	2,000,000	Do.
Nevada:							
Upper Carson.....	3,500	35,500		4,800	12	2,000,000	Ready.
Pyramid Lake.....	15,000	1,000		4,000	4	1,200,000	Do.
New Mexico:							
San Juan.....	\$125,000			5,200	8	(*)	Not ready.
Middle Rio Grande drainage.....		100,000		4,800	7½	5,500,000	Ready.
Oregon:							
Klamath pumping units.....		23,000		4,100	12	1,200,000	Do.
Langell Valley.....		17,000		4,200	12½	1,000,000	Do.
Tule Lake.....	17,000			4,000	14	1,250,000	Do.
Rogue River.....		30,000		1,600	20	2,000,000	Not ready.
Greater Umatilla.....	3,500	{ 12,000 3,050 }		500	8½	3,100,000	Do.
Owyhee.....	6,000	17,000		2,200	10	2,100,000	Do.
Deschutes.....		200,000		3,200	9	12,000,000	Do.
Lower Powder River.....	\$38,000	25,000		3,000	13	7,000,000	Do.
Horsefly storage.....	2,000	1,400		4,100	12½	300,000	Do.
South Dakota:							
Belle Fourche extension.....	11,000	22,300	3,917	2,800	14½	700,000	Do.
Texas:							
Tornilla-Fort Hancock unit.....		27,000		3,500	8	1,200,000	Do.
Utah:							
Castle Peak.....	70,000			5,200	9	7,000,000	Do.
Price River.....	30,000			5,500	12	(*)	Do.
Dixie.....	30,000			3,000	8½	(*)	Do.
Utah Valley drainage.....		30,000		4,500	18	1,000,000	Do.
Washington:							
Yakima High line.....	13,600	130,000	6,000	1,000	7	20,000,000	Do.
Kittitas.....	5,000	62,500	2,500	1,800	9½	8,500,000	Ready.
Wyoming:							
Riverton.....	31,000	40,000	13,000	5,100	19	6,000,000	Do.
Francie extension.....	35,000	1,000	1,800	4,200	6	500,000	Do.
Heart Mountain unit.....	34,100	1,500	3,200	4,900	6	3,300,000	Not ready.
Willwood unit.....	14,700	320	600	4,300	6	900,000	Ready.
Oregon Basin.....	68,000			4,500	6	(*)	Not ready.

¹ These estimates must be considered as merely preliminary and subject to change.

² Indian.

³ In Fort Hall Indian Reservation.

⁴ In Targhee National Forest.

⁵ In Navajo Indian Reservation.

⁶ No estimate.

⁷ Railroad.

⁸ 17,000 withdrawn under Carey Act.

IRRIGABLE AND IRRIGATED ACREAGE.

The statistics of irrigation show that on the projects of the Reclamation Service there are about 500,000 acres of land to which the service is ready to deliver water but which are not irrigated. This immediately raises the query as to why this is so, and suggests that further development be delayed. As a matter of fact, such a conclusion would be entirely unwarranted.

The most important item in the acreage not irrigated consists of the unirrigated portions of farms that are occupied and cultivated but have not been wholly brought under cultivation. The reduction of the average farm in the arid region to actual cultivation by the occupier requires clearing, leveling, and ditching, and is a slow process with the average settler who has limited capital and is probably depending upon his own efforts and his own teams to accomplish results. The facts are that on the average three-fourths of each occupied farm is actually under irrigation, and this is a very good showing under the circumstances. Many old settled communities have done little better.

The next item of importance is the acreage represented by holdings of nonresidents or of persons owning more than 160 acres and who are unable to purchase water right for the excess holding. The law prohibits the sale of water rights to nonresidents and to holdings greater than 160 acres. Gradually the excess holdings are being disposed of to new settlers, and the nonresidents are either selling to settlers or are themselves gradually occupying the lands and placing them under cultivation.

A third class is composed of the public lands that are open to entry and have not been filed upon. These are comparatively few, are distributed on several of the public-land projects, and are as a rule lands but recently opened to settlement or are of inferior quality, so that while they may be eventually taken, this is not done until after the better opportunities are exhausted. Roughly speaking, the area covered by crop census to which we can deliver water may be divided about as follows:

	Acres.	Per cent.
Occupied farms partly cultivated.....	1,312,000	82
Nonresident and excess holdings.....	240,000	15
Unentered public lands.....	43,000	3

ADVANTAGES OF IRRIGATION FARMING.

Agriculture in the arid region where irrigation is feasible has several important advantages over that in the humid region. The soils of the arid region by the nature of the case have generally not been leached of their mineral plant foods as have those in the humid region, and they are therefore much richer in this respect on the average and are seldom or never acid, as are soils in the humid region. This quality has the disadvantage at times of leaving the arid lands charged with hurtful alkalies which seldom remain in the humid region on account of their solubility, but where the injurious salts do not predominate the general principle of abundance of mineral plant food obtains and constitutes a distinct advantage for soils of the arid region over those of humid regions.

There is much advantage in being able to apply water to growing crops at just the time and in just the quantity needed and to withhold it at will. Where the water supply is ample this constitutes a very important advantage in arid regions.

Another striking advantage is the preponderance of clear days in an arid region, where the absence of rainy and cloudy weather affords a much larger percentage of sunshine than is found in humid regions. As sunlight is one of the most important essentials of healthy plant growth, this advantage is quite important.

Resulting from these advantages, it appears that the average gross product of agricultural crops on reclamation projects is just about double the average yield from nonirrigated lands in the country at large. The larger product obtainable per acre from irrigated lands justifies and permits a more careful and intensive cultivation, which with a favorable climate and controllable water supply, yields more certain results than the same care in the humid region.

This means that as much product can be obtained from a 40-acre tract under irrigation as from the average 80-acre tract in the humid region. This of course requires more labor per acre, but much less labor in proportion to product. It permits and encourages intensive cultivation and smaller holdings and consequent greater centralization of population. The result is that the isolation of country life is to a large extent eliminated, as the irrigating farmer will have fully twice as many neighbors within a given radius as his prototype in the humid region. The social advantages thus obtained react upon the character of the people and of the communities and other conditions characteristic of irrigated regions to a similar effect.

Cooperation with his neighbors is forced upon the irrigator because it is usually impracticable for him to irrigate his land without such cooperation, the feasible irrigation projects usually being in tracts of many thousands of acres accommodating thousands of families and giving rise to towns, villages, and characteristic civilizations of their own. This condition stimulates the civic conscience and attention to public affairs of common interest, so that the local governments that grow up under such conditions are usually of a superior order and controlled by a superior intelligence on the part of the population living thereunder.

IRRIGATION PROGRESS.

During the past year the operation of the Government under the various reclamation laws has continued to develop the resources of the projects undertaken, as shown by the gradual increase in the area for which the service can supply water, the increase in areas actually irrigated and cropped, and the increase in the value of crop produced. This progressive increase is shown in the following table, which gives statistics only for those areas covered by crop census, excluding practically all those additional areas which are served from the works of the Reclamation Service under Warren Act contracts and from which crop statistics were not obtainable. It is estimated that, including these areas, the crop value in 1918 probably amounted to \$100,000,000 or over.

Year.	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.
1913.....	1,181,362	694,142	637,227	\$15,676,411
1914.....	1,240,875	761,271	703,424	16,475,517
1915.....	1,330,222	814,906	757,613	18,164,452
1916.....	1,405,452	922,821	858,291	32,815,972
1917.....	1,502,468	1,026,663	966,784	56,462,313
1918.....	1,601,934	1,119,566	1,051,193	66,821,396

The statistics given in the above table do not, however, tell the whole story. The easy terms of repayment granted by the Government and the high prices received for their products have combined with the other favorable conditions and with the industry of the people to produce a condition of prosperity beyond the indications of the bare statistics.

CONTRACTS UNDER WARREN ACT.

[Act of Feb. 21, 1911, 36 Stat., 925.]

BOISE PROJECT, IDAHO.

Name of contractor.	Date of contract.	Area in acres.	Amount of water in acre-feet.
Boise-Payette Lumber Co.....	June 15, 1918	100.16	250
Farmers' Cooperative Ditch Co.....	Dec. 3, 1917	15,500	1,000
Farmers' Union Ditch Co.....	Aug. 13, 1917	8,100	2,426
Black Canyon Irrigation District.....	Jan. 2, 1918	39,000	(1)
Nampa & Meridian Irrigation District.....	June 1, 1915	24,557	2,934
New York Canal Co. (Ltd.).....	July 1, 1918	21,498	(2)
Pioneer Irrigation District.....	Feb. 27, 1913	34,400	17,700
Pioneer Irrigation District and Black Canyon Irrigation District.....	May 28, 1919	6,000	43,000
Riverside Irrigation District and Big Bend Irrigation District.....	Feb. 15, 1918	14,385	1,000
Settlers' Irrigation District.....	Feb. 9, 1918	12,000	1,500
Do.....	Feb. 18, 1919	420	(1)
Total.....		175,960.16	

¹ Canal capacity $\frac{1}{2}$ inch per acre.

² Indeterminate.

MINIDOKA PROJECT, IDAHO—JACKSON LAKE ENLARGEMENT UNIT.

Aberdeen-Springfield Canal Co.....	June 4, 1917	65,000	40,000
American Falls Canal Securities Co.....	Dec. 28, 1917	7,000	2,685
Armsberger, J. R.....	June 1, 1918		300
Bradbury, W. A., and J. C. McMullen.....	Apr. 23, 1917	280	200
Burgess Canal & Irrigating Co.....	Mar. 28, 1917	23,000	5,120
Conant Creek Canal Co. (Ltd.).....	Aug. 5, 1918		240
Dewey Canal Co.....	Aug. 4, 1918		240
Enterprise Canal Co. (Ltd.).....	Apr. 15, 1917	7,000	6,100
Enterprise Irrigation District.....	Aug. 2, 1918		2,400
Farmers' Friend Canal Co. (Ltd.).....	Aug. 5, 1918		800
Farmers' Friend Irrigation Co.....	June 18, 1917	10,000	2,000
Farmers' Own Ditch Co. (Ltd.).....	Aug. 2, 1918		240
Harrison Canal & Irrigation Co.....	Apr. 5, 1917	13,000	5,000
Independent Canal Co. (Ltd.).....	Aug. 3, 1918		2,400
Kuhn Irrigation & Canal Co. and Twin Falls Canal Co.....	Feb. 25, 1913	410,000	400,000
Last Chance Canal Co. (Ltd.).....	Aug. 4, 1918		480
Lenroot Canal Co. (Ltd.).....	July 27, 1917	4,000	3,000
Lowder Slough Canal Co. (Ltd.).....	Apr. 15, 1917	1,300	1,040
Lyle, W. S.....	do.....	160	155
Martin Canal Co.....	do.....	1,500	1,500
New Sweden Irrigation District.....	June 29, 1917	27,000	5,000
Poplar Irrigation District.....	May 1, 1917	1,200	1,200
Peoples' Canal & Irrigation Co.....	Apr. 15, 1917	20,000	8,000
Rudy Irrigation Canal Co.....	do.....	8,000	2,000
Snake River Valley Irrigation District.....	Aug. 11, 1917	24,000	15,000
Sunnydell Irrigation District.....	June 8, 1917	4,400	4,000
Total.....		626,840	

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Name of contractor.	Date of contract.	Area in acres.	Amount of water in acre-feet.
Beerline Irrigation Canal Co.....	July 3, 1918	1,113	1,639
Brown's Creek Irrigation District.....	July 14, 1913	7,784	19,900
Central Irrigation District.....	Mar. 6, 1913	1,501	4,050
Chimney Rock Irrigation District.....	do.....	3,916	10,300
Gering Irrigation District.....	Jan. 17, 1913	14,243	35,500
Tri-State Land Co. (Farmers' Irrigation District).....	Aug. 20, 1912	60,000	180,000
Bridgeport Irrigation District.....	June 14, 1915	17,434	37,478
Goshen Land Co. (and Lingle Water Users' Association).....	July 1, 1915	9,800	32,853
Pleasant Valley Lateral Association.....	June 16, 1915	4,000	13,522
Lincoln Land Co.....	Apr. 17, 1917	954	1,941
Dawson County Irrigation Co. ¹	Mar. 19, 1919	.....	5,000
Total.....		120,745	.....

¹ Temporary contract for season of 1919 only.

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Boyer Aune and Bessie Hull Aune.....	May 2, 1918	36.8
--------------------------------------	-------------	------	-------

STRAWBERRY VALLEY PROJECT, UTAH.

P. E. Whiting.....	June 8, 1916	40	40
John I. Hayes.....	do.....	20	20
William A. Pace.....	Sept. 26, 1916	120	50
Soldier Fork Unit.....	Dec. 15, 1916	130	67.5
Do.....	July 16, 1918	55	55
Clinton Unit.....	June 1, 1915	1,458.41	700.9
Payson City.....	Jan. 8, 1917	(1)	200
Spanish Fork City, No. 1655.....	Apr. 28, 1917	(1)	400
Spanish Fork City, No. 1710.....	Aug. 21, 1918	(1)	40
Springville Irrigation District.....	Dec. 29, 1917	3,000	2,400
Mapleton Irrigation District.....	Jan. 2, 1918	4,000	3,600
Do.....	Apr. 5, 1919	1,000	1,108
Total.....		9,823.41	.....

¹ City lots.

YAKIMA PROJECT, WASHINGTON.

Sunnyside Irrigation District.....	Oct. 6, 1914	4,630	18,520
Snipes Mountain Irrigation District.....	Nov. 16, 1914	1,915	5,268.25
Outlook Irrigation District.....	Nov. 23, 1914	4,225	2,928.50
Union Gap Irrigation District.....	Mar. 2, 1915	1,500	4,275
Grandview Irrigation District.....	Aug. 4, 1916	3,994	10,983.50
Prosser Irrigation District.....	Dec. 1, 1917	2,150	6,460
W. O. Bradbury.....	May 22, 1916	18	54
Taylor & Robar.....	Nov. 24, 1916	30	90
Herbert Bostock.....	July 19, 1917	30	90
C. S. Mead.....	May 23, 1918	50	76
H. L. Stonebraker.....	Nov. 22, 1918	40	120
Total.....		18,582	.....
Grand total.....		951,987.37	.....

NO NEW PROJECTS UNDERTAKEN.

No new projects have been undertaken within the past year, as there have been no funds available for this purpose. The gradual decline in the receipts from the sales of public lands, due largely to the wholesale disposal of these lands under the operation of the 640-acre homestead act, has naturally greatly restricted the operations under the reclamation act. The small payments provided by law

from the irrigated lands have kept the returns from the constructed projects to a low point. It is now necessary, under the provisions of existing law, to set aside \$1,000,000 per annum from these receipts to repay the advances to the reclamation fund which were provided by the act of 1910, known as the "bond loan." It has been possible on this account only slightly to extend the irrigated area by some extension of canal systems and to take care of water-logged conditions on some of the projects.

SEEPAGE AND DRAINAGE.

The industry of irrigation by which water is applied to the surface of the soil for the growing of crops is necessarily attended by a considerable escape of such water to the subsoil, where in most cases it joins ground water, and this gradually rises. Such a condition is of course aggravated and expedited by wasteful applications of water, and this is very difficult to avoid if the soils are open and porous, but even in case of tight soils and a reasonably economical use of water some rise of ground water is likely to occur and very few irrigated regions of magnitude exist in the world which have not attached to them an important drainage problem. Accordingly, during the last few years one of the largest and most important activities of the Reclamation Service has been the provision of suitable drainage works on the various projects where these are required. In some cases these have been practically completed and are serving their purpose well, but in the majority of cases they are still in progress and the available construction funds are not sufficient to carry this on with the requisite speed and economy. Hence considerable areas which ought to be returning construction charges are held back for this reason, as it is of course impossible to collect the charges from unproductive land.

RECLAMATION PROJECT OPERATIONS.

The Salt River project in Arizona is being operated by the local organization of water users under a contract by which the Secretary of the Interior turned over the works and the income of the large power plants constructed in connection with the project. It is in a prosperous condition, and the income from power a good deal more than pays the construction charges. The Government connection with this project is confined to occasional inspection and supervision, as provided in the contract. The ground water is rising on this project and will require early attention in order to prevent injury to a considerable area of land. This has been investigated by the water users' association, which is alive to the problem and will doubtless take necessary action.

On the Yuma project, Arizona-California, the Yuma Valley, which lies in Arizona, has been placed under public notice, but the payments are being contested by the water users' association. This contest came to trial in the month of April and the case is now held under advisement by the court. The Yuma Valley is exceedingly prosperous, having, with one exception, the highest gross yield per acre of any of the projects of the Reclamation Service. This for the year 1918 was over \$113 per acre, exclusive of live-stock increase. An-

nouncement has been made of the sale of a portion of the lands on the Yuma Mesa, which will be irrigated with water pumped from the main canal south of the city of Yuma under the provisions of a special act of Congress. A contract has been executed with the Imperial irrigation district to connect its system with Laguna Dam and provide better security for its water supply.

The Orland project in California is regarded as the first unit of a comprehensive project for the development of the Sacramento Valley. It, however, stands alone as a self-supporting project with an ample water supply from Stony Creek, a tributary of Sacramento River and has been practically completed. Public notice on this project was issued in 1916 and all payments are made promptly when they fall due by the association as a whole. Thus, all the annoyance, expense, and risk of delinquency are voluntarily shouldered by the water users' association, which has shown a commendable spirit of cooperation from the first. The project is prosperous and constantly growing in development. The only construction work in progress is a small amount of permanent canal lining which was provided for in the current public notice and which is necessary for checking the seepage from the canals constructed in coarse material.

The Grand Valley project in Colorado is delivering water to a portion of the land which has been opened to entry and occupied by settlers. The agricultural operations are gradually extending and results are encouraging. The physical conditions in this valley are difficult on account of the seamy shale which occurs on the canal system and which has required a large amount of maintenance and betterment work to render the canals tight. Aside from these difficulties the works are operating in a very satisfactory manner.

The Uncompahgre project, Colorado, is being operated by the United States under contract with the water users' association upon the payment of the cost of such operation by the association. The contract provides that the operation may be turned over to the water users' association whenever they so elect, and this is being consummated. The existing contract provides for the operation and cost for a period of five years, at the end of which period the project is to be opened under public notice unless further extension is made by the Secretary of the Interior. At that time, according to the contract, the construction repayments will begin. The construction of the project is completed so far as the plans of the Government have been made, but the distribution systems, which remain in the hands of the irrigators, are very unsatisfactory and should be enlarged and improved. The cultivation of the lands is gradually extending and slow improvement is being made in the use of water which is very wastefully applied to the lands. Efforts are being made to introduce the rotation system and to charge for water on an acre-foot basis, which will be necessary before good practice in the economy of water can be hoped for. The excessive application of water is manifested by a rising water table and the destruction of the fertility of some of the land. Agriculture in general is successful, and the settlers are prosperous.

The Boise project in Idaho includes the Arrowrock and Deer Flat Reservoirs which have been completed, and a canal system which now delivers water to the main body of the project. Contemplated extensions will be made gradually to conform to better practices

regarding the use of water which is sufficient for irrigating about 40,000 additional acres of land if used with reasonable economy. Public notice was issued in 1917 announcing the charges on the completed portion of the project, but the water users brought suit to escape a portion of the repayment and this has been tried in the United States court. A preliminary opinion has been handed down by the court, which holds that the full cost of the project must be paid by the beneficiaries, but withholds decision upon several points of detail.

In addition to the main project, the United States, under 11 special contracts, delivers storage water to about 150,000 acres of lands that are served by independent systems. The current year has been one of exceptional drouth and it was preceded also by a very dry year. It is the general opinion, as expressed by the water users and the local press that the benefits the past season from the storage works constructed by the Government have been greater than the total cost of those works in the increased product upon the lands served by stored water which would have been without water except for these works. The project as a whole is very productive and successful.

The Minidoka project in Idaho as originally planned has been completed, but several extensions are possible and desirable. The project is in two portions—that which is served with irrigation water by gravity has been formed into an irrigation district which operates the canal system serving it under contract with the United States; the pumping unit on the south side of the river is operated by the United States. The results of irrigation in this region are very striking and exceptionally successful.

The Huntley project in Montana is practically completed and is one of the most successful and thickly settled projects of the service. Drainage work is in progress and some enlargement of a portion of the delivery system is also being made. Construction payments upon the lands served are being regularly made.

In the Milk River Valley, Mont., water is being delivered through a canal leading from St. Mary River which diverts that river just below St. Mary Lake. By a treaty arrangement with Canada the waters of the St. Mary are divided on an agreed basis and this water is being used very completely the present year. The demand for irrigation water, on account of the excessive dryness, is greater than ever before. The water is all used on a rental basis, partly through the works of the service and partly delivered to canal systems of private or cooperative companies.

On the Sun River project, Montana, the original unit on the south side of Sun River is being operated as usual. On the north side of the river where many of the settlers were attempting to secure title to their homesteads without the liability for irrigation water which is included in their filing papers, a series of three dry years in succession has shown that dry farming is not profitable and has revived the demand for irrigation water. Difficulties with the canal systems have been encountered on account of the unfavorable material with which they were constructed, but it is possible this year to deliver water to about 25,000 acres and a considerable portion of this is being served on a rental basis. A beet-sugar factory would be profitable in this region.

The Reclamation Service experienced serious water shortage on one project—the Okanogan project in northern Washington—in 1918, and while there was some shortage also in 1919, it was not so great. Pumping plants were installed at Salmon Lake and Duck Lake to supplement the storage reservoirs which did not entirely fill. The additional pumping capacity and the enlargement of the reservoir hold-over capacity are the remedies being carried out.

The Yakima project in Washington includes a large system of storage reservoirs and two canal systems known as the Sunnyside unit and the Tieton unit. The project as a whole is very productive and prosperous and strong pressure is being made to secure the construction of more storage, the extension of existing canal systems, and the construction of new canals from the Yakima River and its tributaries. The excellent results obtained show that this would be a wise development. The Yakima project as a whole is one of the foremost in general prosperity and in returning the cost of this construction.

The Shoshone project in Wyoming is being gradually extended by additions to the canal and lateral systems on the north side of the Shoshone River. The drainage system which has been largely completed and has been very successful, is also being extended under contract with the water users in accordance with law. The lands are very productive and the project very prosperous. Preparations are being made for the construction of an additional unit on the south side of the Shoshone River for which ample storage capacity has been provided in the Shoshone Reservoir.

The value of the agricultural products exclusive of live stock produced by the Government reclamation projects during the season of 1918, amounting to nearly \$67,000,000, has been over half of the net cost of construction of all of the projects during the last 17 years. On some of the projects the 1918 production has exceeded the total construction cost, and even better results are anticipated for the current agricultural year. The results in the extension of agriculture and of homemaking have justified the expectations of the advocates of this activity and argue strongly for its extension, for which there is great and growing demand.

SUMMARY OF CONSTRUCTION RESULTS.

The following table gives in concise form a review of the work done by the Service to June 30, 1919. It is especially noteworthy that in spite of adverse labor conditions the amount of excavation totaled more than 14,000,000 cubic yards, and that 575 miles of canals and drains were constructed.

Summary of construction results, June 30, 1919.

Items.	To June 30, 1919.		To June 30, 1918.		Increase.	
LANDS.						
Estimated area of projects on completion.....	<i>Acres.</i> 3,212,008	<i>Farms.</i> 67,447	<i>Acres.</i> 3,081,480	<i>Farms.</i> 62,477	<i>Acres.</i> 130,528	<i>Farms.</i> 4,970
Reservoir capacity available (original).....	<i>Acre-feet.</i> 9,430,910		<i>Acre-feet.</i> 9,197,460		<i>Acre-feet.</i> 233,450	
CANALS, DITCHES, AND DRAINS.	<i>Miles.</i>		<i>Miles.</i>		<i>Miles.</i>	
Canals over 800 second-foot capacity.....	438		420		18	
Canals 301 to 800 second-foot capacity.....	670		667		3	
Canals 50 to 300 second-foot capacity.....	1,919		1,807		112	
Canals less than 50 second-foot capacity.....	7,807		7,544		263	
Total canals.....	10,834		10,438		396	
Waste-water ditches.....	665		495		170	
Drains, open.....	643		643			
Drains, closed.....	172		163		9	
Total.....	1,480		1,301		179	
Grand total.....	12,314		11,739		575	
TUNNELS.						
Number.....	95		94		1	
Length (feet).....	143,847		142,237		1,610	
STORAGE AND DIVERSION DAMS.	<i>Cubic yards.</i>		<i>Cubic yards.</i>		<i>Cubic yards.</i>	
Masonry.....	2,087,991		2,084,187		3,804	
Earth.....	10,220,671		9,998,351		222,320	
Rock fill and crib.....	1,203,386		1,185,529		17,857	
Total.....	13,512,048		13,268,067		243,981	
DIKES AND LEVEES.	<i>Feet.</i>	<i>Cubic yards.</i>	<i>Feet.</i>	<i>Cubic yards.</i>	<i>Feet.</i>	<i>Cubic yards.</i>
Length and volume.....	513,989	4,517,664	504,426	4,470,702	9,563	46,962
CANAL STRUCTURES.	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>
Costing over \$2,000.....	1,044	201	958	184	86	17
Costing \$500 to \$2,000.....	2,100	528	2,011	478	89	50
Costing \$100 to \$500.....	9,896	5,870	9,177	5,011	719	869
Costing less than \$100.....	19,682	57,824	16,386	55,008	3,296	2,821
Total.....	32,722	64,423	28,532	60,676	4,190	3,747
Grand total.....	97,145		89,208		7,937	
BRIDGES.	<i>Number.</i>	<i>Length.</i>	<i>Number.</i>	<i>Length.</i>	<i>Number.</i>	<i>Length.</i>
Steel.....	106	<i>Feet.</i> 8,579	106	8,466	1	113
Combination.....	414	12,542	414	12,542		
Wood.....	6,134	135,218	5,500	117,606	634	17,612
Concrete.....	346	4,399	342	4,254	4	145
Total.....	7,000	160,738	6,361	142,868	639	17,870
CULVERTS.						
Concrete.....	1,930	95,088	1,832	88,719	98	6,369
Metal.....	1,580	54,929	1,433	52,005	127	2,924
Terra cotta.....	1,505	64,096	1,096	50,947	409	13,149
Wood.....	4,049	96,492	3,164	72,213	886	24,279
Total.....	9,044	310,605	7,525	263,884	1,519	46,721
PIPE.	<i>Linear feet.</i>		<i>Linear feet.</i>		<i>Linear feet.</i>	
Concrete.....	628,572		596,250		32,322	
Metal.....	247,136		239,616		7,520	
Terra cotta (tile).....	1,370,375		1,166,337		104,038	
Wood.....	496,432		471,236		24,196	
Total.....	2,641,515		2,473,439		168,076	

Summary of construction results, June 30, 1919—Continued.

Items.	To June 30, 1919.		To June 30, 1918.		Increase.	
	Number.	Length.	Number.	Length.	Number.	Length.
FLUMES.						
Concrete.....	85	<i>Feet.</i> 27,658	80	<i>Feet.</i> 20,427	5	<i>Feet.</i> 7,231
Metal.....	960	159,072	755	150,799	205	8,273
Wood.....	2,141	449,569	1,928	433,947	213	15,622
Total.....	3,186	636,299	2,763	605,173	423	31,126
CANALS LINED.						
Length.....miles..	307.57	4.10	307.30	4.10	0.27	.....
Total.....	311.67		311.40		0.27	
BUILDINGS.						
Offices.....	<i>Number.</i> 97		<i>Number.</i> 83		<i>Number.</i> 14	
Residences.....	636		590		46	
Power plants.....	29		26		3	
Pumping stations.....	89		69		20	
Barns, storehouses, etc.....	523		495		28	
Total.....	1,374		1,263		111	
WELLS.						
Number and depth.....	448	47,879	416	35,411	32	12,468
COMMUNICATIONS.						
Roads.....	<i>Miles.</i> 970		<i>Miles.</i> 955		<i>Miles.</i> 15	
Railroads.....	83		83		.....
Telephone lines.....	3,126		2,934		192	
Transmission lines.....	615		450		165	
Total.....	4,794		4,422		372	
POWER DEVELOPED.						
Water and steam.....horsepower..	59,633		48,093		11,540	
EXCAVATION.						
Class 1, earth.....	<i>Cubic yards.</i> 154,473,487		<i>Cubic yards.</i> 141,015,518		<i>Cubic yards.</i> 13,457,969	
Class 2, indurated material.....	9,913,065		9,569,457		343,608	
Class 3, rock.....	8,409,722		8,199,793		209,929	
Total.....	172,796,274		158,784,768		14,011,506	
RIPRAP.....cubic yards..	1,892,728		1,735,893		156,835	
PAVING.....square yards..	819,408		807,485		11,923	
CONCRETE.....cubic yards..	3,023,446		2,976,448		46,998	
CEMENT.....barrels.....	2,971,330		2,919,107		52,223	

SETTLEMENT.

Owing to the improved financial condition of the project farmers, due to good crops and war prices, public interest in Government irrigated lands has become very keen, and the inquiries concerning future public openings showed a marked increase during the year. The widespread hunger for irrigated Government land was shown by the number of inquiries which followed the announcement of an opening of 16 farms on the Yuma project. More than a thousand letters were received, nearly every State in the Union being represented. It was necessary to hold a drawing for every one of the farms, as 724 applicants were present at the opening.

Two small land openings occurred during the year—Newlands project, 11 farms; Yuma project, 16 farms. On June 30, 1918, there were 295 unentered farm units on all the reclamation projects. On June 30, 1919, there were 133 unentered farms. During the year there were added 27 units, so that the total number of farm units entered that year was 189. The remaining unentered farms represent the poorest tracts in the projects. Many are seeped and must be drained; others are rough or badly cut by canals and ditches.

The past year was the most active in the history of the Service in the transfer of private lands on the projects. The sales by original owners in whole or in part of their ranches amounted to millions of dollars, and prices of land which a few years ago was desert and worthless ranged from \$100 to \$1,000 per acre. In these transfers it was noted that many of the purchasers were from other projects whereon they had been successful, and the change was made usually by reason of a desire for a milder climate. Montana farmers have sold at good prices to Mississippi Valley farmers and have transferred to Idaho and Oregon, while the Idaho farmer has joined the numbers thronging to California. With plenty of money and experience, the newcomers are valuable additions to the communities in which they locate.

Land values are constantly rising on all the projects. A notable example of this is shown in the sale of State and school lands on the Belle Fourche project last April. The lands offered, 2,124 acres, were listed for sale three years ago with no purchasers, although the prices were very reasonable and the terms most generous. In the April sale every acre was sold and the competition was so keen that the prices in every case were above the minimum set by the State. Lands which in 1916 found no bidders at \$12 to \$20 per acre sold quickly for \$20 to \$50, the purchaser in each instance assuming an obligation to pay \$60 per acre to the Government for a water right.

The demand of the soldiers for opportunities to acquire land overshadows everything in connection with settlement work, but it will not be a wise policy to overlook the very urgent and increasing call for similar opportunities from citizens who were unable to wear the colors. Every consideration of good policy that can be advanced stresses the need of increasing greatly the acreage for settlers on all public land projects as well as the taking up of new projects without delay. Neglect and long deferment of definite plans for rapid land development may still this hunger.

Including areas under Warren Act contracts, served from Government works, the national reclamation policy has resulted in an annual crop production of \$100,000,000 or over from lands which a short time ago returned nothing. To it must be attributed also the establishment of more than 200,000 people in prosperous and contented homes on the land and an equal number in the cities, towns, and villages which are the result of this agricultural development. The progress being made by these communities equals that of the most prosperous regions of our country. With millions of acres of equally favorable land awaiting development and thousands of citizens clamoring for farms, it is most important that a liberal policy in providing funds to construct the necessary works should be followed by Congress.

During the coming year land openings will occur on the North Platte and Shoshone projects, and a few additional farms will be available on the Newlands project. In December, 1919, 6,000 acres of land on the Yuma Mesa will be sold at auction. The funds derived from the sale are to be used in constructing a power and pumping plant and the distribution system. These lands are described as being practically frostless and peculiarly adapted to the production of citrus fruits.

ARE PROJECT SETTLERS PERMANENT?

In order to determine to what degree settlement on reclamation projects is permanent, an investigation was made of a number of representative projects:

Five of the projects selected for investigation, namely, Huntley, Minidoka, North Platte, Shoshone, and Umatilla, were thought to have experienced unusually trying conditions for the settlers, and one, Boise, was thought to have been quite favorable. Letters were sent to the project managers of these six projects asking the number of original settlers still in possession and the number of transfers made by other settlers, together with any proper explanations.

Although the figures are probably not infallible, they are as nearly correct as possible. The margin of error is doubtless small in any case. The chance for greatest variation is in the number given for total farm units, because these are constantly changing and subdividing.

One of the projects, Minidoka, was also checked up by consulting the tract books in the General Land Office in Washington.

Following is a tabulation from the reports received:

Project.	Settlers still in possession, or who have satisfied homestead requirements.	Total number of settlers.	Per cent of total.	Total number of farm units.	Number of settlers per farm unit.
Boise, Idaho.....	987	1,273	89.1	1,107	1.14
Huntley, Mont.....	383	589	65.0	589	1.42
Minidoka, Idaho.....	899	2,709	55.8	1,609	1.68
North Platte, Nebr.-Wyo.....	723	2,155	54.0	1,337	1.61
Shoshone, Wyo.....	405	902	66.5	609	1.48
Umatilla, Oreg.....	136	289	69.3	196	1.47
Total.....	3,533	8,167	65.2	5,447	1.49

From the figures quoted, it is computed that the average number of settlers to a farm unit on the Boise project, where conditions were favorable, was 1.14, or slightly more than one—truly a remarkable showing when it is considered that farms in general often go through many changes in ownership, and only 1.68 on the Minidoka project, where conditions were adverse.

Opponents to homestead and reclamation acts have argued that settlers take up their farms merely for speculation. Although no effort has been made to learn the changes on reclamation projects after title had been obtained, results indicate slight changes during the time of proving up.

Before the end of the period required for residence, settlers may relinquish their right and for money consideration pass on the farm unit. This can safely be done only when the relinquishment paper is filed simultaneously with another entry. Any such transactions may come under the notice of the project office if the settlers are known personally. Giving up an entry does not by any means indicate that the entryman has failed to make good on his farm. It may show quite the contrary—that he has succeeded so well he is able to sell out his improved farm for a good figure. This kind of speculation can hardly be avoided.

The first few years of the Reclamation Service were the most severe for the project settlers. Water was not available at this time, and under the law settlers could not be prevented from taking up land which might not receive water for years. Having seen how often it worked hardship for settlers to struggle along until water was ready, the service secured the passage of a law which prohibited the entering of farm units until the irrigating system is in operation, resulting unquestionably in even greater permanence of settlers on projects opened under these conditions.

The investigation has shown conclusively in connection with Federal projects that there is not the slightest basis for the statement so often and so loosely made that "throughout the newer parts of America at least three settlers in succession attempt to develop a farm before one succeeds."

IRRIGATION AND CROP RESULTS, 1918.

The usual census of irrigation and crop results on the Government reclamation projects, as described in previous annual reports, was continued during the period covered by the present report. Obviously such information is not adapted to fiscal years and the figures that follow are for the last growing season or calendar year, that of 1918. On the Salt River project, Arizona, where some crop is growing at all times of the year, a convenient period is taken as the agricultural year from October 1 to September 30, which date approximately marks the transition from the heavy summer production to the winter crops. On that project operation and maintenance of the works built by the Government have been turned over to the Salt River Valley Water Users' Association and in the following statistics of crop production the figures for that project are gathered and furnished by the association. Similarly on the gravity unit of the Minidoka project, Idaho, the Minidoka irrigation district handles the operation and maintenance and has compiled the crop data. On the King Hill project in the same State, the data are furnished by the King Hill irrigation district. The poor showing on this project is due to the bad condition of the canal system, which was built under private auspices. The United States has undertaken its reconstruction and this work is under way, but not sufficiently advanced to insure a good water supply to the bulk of the project. The Government has not undertaken operation and maintenance on this project, which are handled by the district.

In the discussion of the projects in subsequent pages of this report the crop report of each is given. In the adjoined tables these reports

have been summarized, and further details are given in the appendix.

It will be noted that these reports do not give the total values of farm products in that they include nothing from farm animals. The project census does not cover the income from live stock or stock products, but it is known that large additional returns are realized from sales of animals, poultry, dairy products, wool, and honey.

It should also be noted that the crop reports by no means cover the entire area to which water is made available and delivered from the works built by the Reclamation Service. In general these statistics are limited to those areas for which the United States has built a complete system from the point of storage or diversion to the laterals serving each farm and where the Government is operating such works, thus employing a force of ditch riders in frequent touch with the irrigators. This provides a ready means of gathering census data of more than ordinary accuracy and at little or no extra expense, since the time for collecting these coincides with that when the water deliveries are dwindling in the fall and the ditch riders, while still required for occasional deliveries, have less onerous duties in connection with the operation and protection of the system.

In addition to the tracts covered by the crop reports there is a large and growing area dependent in various degrees on the Government works for water supply through special contracts, mainly under the Warren Act, calling for delivery of water in bulk from the reservoirs or at various stages of distribution to the land. This large area is not covered by the crop reports nor included in the following statistics though comparable in the aggregate to the area thus reported. The following tabulations, therefore, are merely summaries of the crop reports obtained and are so entitled; they fail to give, possibly by 50 per cent, the total production made possible by the works built under the reclamation law.

However, a summary of the crop reports received gives some impressive figures of the values that have been secured from the desert lands by the provision of irrigation water. The following table summarizes the reports by projects, and it will be noticed that for several of these the crop values produced average over \$100 per acre. These averages are for all farms and all crops in the large tracts covered by the census, including the least successful with the most successful irrigators and averaging with banner crops those of low yield or any of entire failure due to pests or other causes. The average returns per acre therefore are an index for a large area in each case, and far greater results are secured by many of the most skilled and successful settlers.

Summary of 1918 crop reports by projects.¹

State and project.	Irrigable acreage. ²	Irrigated acreage.	Cropped acreage. ³	Crop value.	
				Total.	Per acre.
Arizona: Salt River.....	4 212,960	4 205,616	184,432	\$18,188,800	\$98.70
Arizona-California: Yuma.....	73,000	45,670	45,049	5,105,132	113.32
California: Orland.....	20,533	14,764	12,075	709,172	58.73
Colorado:					
Grand Valley.....	35,000	8,102	6,387	414,310	64.87
Uncompahgre.....	100,000	58,270	57,310	3,302,460	57.62
Idaho:					
Boise.....	4 274,220	4 117,024			
Covered by census.....	143,780	95,074	90,720	5,154,646	56.80
King Hill ⁷	14,500	1,849	1,677	45,588	27.18
Minidoka.....	121,392	106,061	98,182	5,168,078	52.64
Montana:					
Huntley.....	31,360	19,262	19,262	750,963	39.00
Milk River ⁸	58,000	24,843	23,800	408,716	17.17
Sun River ⁹	14,978	7,569	7,532	245,852	31.39
Montana-North Dakota: Lower Yellowstone ¹⁰	42,232	21,075	21,000	669,191	31.85
Nebraska-Wyoming:					
North Platte—					
Interstate unit.....		88,771	85,308	3,100,710	36.35
N. P. C. & C. Co. lands.....		9,137	9,137	313,064	34.26
Fort Laramie ¹¹	12,132	4,865	4,865	61,815	12.71
Nevada: Newlands.....	71,817	42,311	41,490	1,626,142	53.15
New Mexico: Carlisbad.....	24,990	19,460	18,200	1,105,515	60.74
New Mexico-Texas: Rio Grande.....	92,300	64,781	64,002	4,237,030	66.20
Oregon: Umatilla.....	24,658	9,100	6,819	400,642	58.75
Oregon-California: Klamath.....	50,000	33,268	32,127	929,131	28.92
South Dakota: Belle Fourche.....	82,592	52,445	52,445	1,276,115	24.36
Utah: Strawberry Valley.....	50,000	32,539	29,788	1,642,327	55.13
Washington:					
Okanogan.....	10,099	6,402	5,287	749,982	141.85
Yakima—					
Sunnyside unit.....	98,537	84,650	70,465	7,213,392	102.36
Tieton unit.....	32,000	26,400	25,845	2,516,251	97.36
Wyoming-Shoshone:					
Garland unit.....		33,552	32,960	1,370,060	41.59
Frammie unit ¹²	55,296	4,730	4,729	115,722	24.47
Total.....	1,732,374	1,141,516			
Covered by census.....	1,601,934	1,119,566	1,061,193	66,821,396	63.60

¹ Excluding substantial areas (private canals) to which water is furnished under the Warren Act. Data are for calendar year (irrigation season), except on Salt River project data are for corresponding "agricultural year," October, 1917, to November, 1918.

² Area Reclamation Service was prepared to supply water.

³ Irrigated crops. Excludes small areas on few projects cropped by dry farming.

⁴ Includes so-called "dry lands" given right to rent water temporarily on account of ample storage.

⁵ Includes about 5,000 acres within town sites, about 11,000 acres reported "vacant" and probably largely pastured, and over 5,000 acres of "home tracts" including house lots, etc.

⁶ Irrigable acreage includes New York Canal, Nampa-Meridian, and Pioneer district lands served project water. Irrigated acreage here reported is limited to area served full water supply, excluding vested right lands given partial service.

⁷ Poor results on this project are due to condition of canal system, which was built under private auspices. The United States has undertaken its reconstruction; operation and maintenance are handled by the settlers through an irrigation district.

⁸ Crop reports covered an additional area of 3,119 acres cropped by dry farming, producing crops worth \$21,619, or \$6.93 per acre.

⁹ Above figures are for 187 irrigated farms, which included small tracts farmed without irrigation. In addition, crop reports covered 7 farms operated without irrigation, on which 109 acres yielded crops worth \$1,998, or \$18.33 per acre.

¹⁰ Crop reports covered an additional area of 5,345 acres dry-farmed producing crops worth \$60,886, or \$11.39 per acre.

¹¹ New lands, first year of irrigation.

¹² For crops in full production, excluding 9,662 acres of wild-grass pasture and 3,081 acres otherwise not in full production. For all crops, \$39.30.

For all projects the crop reports show a gross value of over \$66,000,000, or an average of \$63.60 for each of the 1,050,000 acres cropped. These reports covered an irrigated acreage of 1,119,000 and 1,600,000 acres that were irrigable, i. e., for which the works were ready to supply water. This does not, however, indicate a failure to utilize 500,000 acres and the water ready for it, as shown in the preceding discussion.

For the Salt River project, Arizona, the water users' association reported a total crop value of over \$18,000,000. Under the contract by which the association assumed the operation and maintenance of the works and agreed to reimburse the United States for their construction, the amount fixed for the latter purpose is approximately \$10,279,000. Thus the crop value in a single year is more than 150 per cent of the construction cost the association is to repay to the United States over a period of 20 years and most of which will be supplied by power profits from the project works.

On some of the other projects the development has reached the stage where the annual crop value is comparable to the total cost of building the irrigation works. The Minidoka project, Idaho, which cost about \$5,700,000, yielded crops in 1918 worth \$5,160,000. Prior to the Government work the project was entirely sage-brush desert. The Yakima project, Washington, costing to date about \$10,000,000, yielded crops worth \$9,733,000 in 1918.

In the following table the crop reports are summarized by crops and comparison with similar tabulations for previous years shows relatively small changes in the general character and relative importance of the crops grown. Alfalfa continues as the great basic crop occupying 40 per cent of the crop area and furnishing one-third of the total crop value. Wheat advanced from 12 per cent in 1917 to 16 per cent of total crop area reported in 1918. The acreage in cotton on the southwestern projects doubled. Eight million bushels of grain, a like amount of vegetables and truck, 165,000,000 pounds of fruit, and 267,000 tons of sugar beets were harvested from the lands covered by the crop reports. But over half the crop area was devoted to hay and forage crops, largely converted to animal products by feeding on the projects.

Summary of crop reports on reclamation projects in 1918.

Crop.	Acreage cropped.		Yields.			Crop value.		
	Total.	Per cent.	Unit.	Total.	Average per acre.	Average per acre.	Total.	Per cent.
Cereals:								
Barley.....	29,698	2.8	Bu....	876,070	29	\$36.20	\$1,074,768	1.6
Corn.....	34,944	3.3	Bu....	1,017,090	29	48.50	1,674,496	2.5
Oats.....	46,951	4.5	Bu....	1,300,410	28	25.00	1,176,413	1.8
Rye.....	1,942	.2	Bu....	20,010	10	15.30	29,741	.....
Wheat.....	166,138	15.8	Bu....	3,708,170	22	43.10	7,164,646	10.7
Total.....	279,673	26.6	Bu....	6,921,850	25	39.60	11,120,064	16.6
Other grain and seed:								
Alfalfa seed.....	9,231	.9	Bu....	41,100	4.5	54.50	502,796	.8
Clover seed.....	8,884	.8	Bu....	35,060	4	71.00	630,855	1.0
Grain sorghum.....	27,326	2.6	Bu....	1,028,040	38	64.40	1,759,718	2.6
Flax seed.....	1,710	.2	Bu....	10,330	6	19.80	33,920	.....
Millet seed.....	642	.....	Bu....	15,840	25	24.90	15,975	.....
Total.....	47,793	4.5	Bu....	1,130,370	.....	61.60	2,943,264	4.4
Hay and forage:								
Alfalfa hay.....	419,612	39.9	Ton....	1,318,780	3.1	54.10	22,720,050	134.0
Clover hay.....	7,290	.7	Ton....	14,500	2	25.30	184,455	.3
Other hay.....	30,840	2.9	Ton....	42,250	1.4	25.40	767,385	1.1
Corn fodder.....	5,234	.5	Ton....	18,110	3.5	24.50	127,864	.2
Peas.....	308	.....	Bu....	4,830	16	33.80	11,960	.....
Other forage.....	3,779	.4	Ton....	25,680	7	56.80	214,751	.4
Pasture.....	113,637	10.8	.....	.....	.....	15.20	1,730,969	2.6
Total.....	580,200	55.2	.....	.....	.....	44.40	25,757,454	38.6

¹ This figure does not represent average value of pasture for a year or season, as considerable areas pastured were also harvested and are included in the duplicate area.

Summary of crop reports on reclamation projects in 1918—Continued.

Crop.	Acreage cropped.		Yields.			Crop value.		
	Total.	Per cent.	Unit.	Total.	Average per acre.	Average per acre.	Total.	Per cent.
Vegetables and truck:								
Beans.....	10,711	1.0	Bu....	141,150	14	\$54.30	\$581,642	\$0.9
Onions.....	407	.....	Bu....	98,660	242	163.00	66,361	.1
Potatoes, white..	28,332	2.7	Bu....	4,484,370	158	133.00	3,775,503	5.7
Potatoes, sweet..	209	.....	Bu....	18,920	91	106.00	21,938	.....
Truck.....	11,635	1.1	.....	.....	.....	146.00	1,701,289	2.5
Total.....	51,294	4.9	.....	.....	.....	120.00	6,146,733	9.2
Fruits and nuts:								
Apples.....	26,121	2.5	Lb....	97,299,240	3,725	107.00	2,809,179	4.2
Peaches.....	1,995	.2	Lb....	6,612,480	3,310	110.00	219,729	.3
Pears.....	3,449	.3	Lb....	21,265,500	6,160	194.00	668,956	1.0
Prunes.....	633	.1	Lb....	3,512,430	5,550	255.00	161,071	.2
Citrus fruits.....	2,151	.2	Lb....	13,571,160	6,310	253.00	544,946	.8
Small fruit.....	987	.1	Lb....	1,803,560	1,830	203.00	200,978	.3
Miscellaneous.....	2,643	.2	Lb....	21,778,320	8,240	272.00	718,968	1.1
Total.....	37,979	3.6	Lb....	165,842,720	4,365	140.00	5,323,267	7.9
Miscellaneous:								
Sugar beets.....	27,133	2.6	Ton....	267,130	9.9	101.00	2,731,871	4.1
Cotton.....	86,470	8.2	Lb....	60,412,540	700	141.00	12,193,480	18.3
Cane.....	4,300	.4	Lb....	18,980	4.4	66.60	286,340	.4
Other crops.....	16,826	1.6	Ton....	.....	.....	18.90	318,952	.5
Total.....	134,729	12.8	.....	.....	.....	115.00	15,530,643	23.3
Duplication.....	80,475	7.6	.....	.....	.....	.....	.....	.....
All crops.....	1,051,193	100.0	.....	.....	.....	63.60	66,821,396	100.0

DRAINAGE.

A description of investigations on drainage work in progress will be found under the discussion of projects. Reference is also made to previous annual reports, especially the twelfth, thirteenth, fourteenth, and sixteenth, for discussion of the causes of seepage and water-logging and the remedies necessary to reclaim and protect lands from damage.

A summary of the work accomplished by the various projects in the period from July 1, 1918, to June 30, 1919, is shown in the following table:

Project.	Miles of drain.		Number machines operated.	Excavation. ¹	Total drainage cost. ²
	Open.	Closed.			
Boise.....	17.5	.....	2	700,211	\$89,163.67
Flathead.....	.....	.....	.....	.....	1,518.77
Grand Valley.....	16.7	.....	4	389,381	\$112,308.44
Huntley.....	.....	0.9	1	5,618	12,016.21
Klamath.....	12.0	.....	3	203,580	54,428.09
Newlands.....	.09	.....	1	3,208	14,212.77
North Platte.....	14.89	1.04	4	413,515	90,755.42
Rio Grande.....	76.00	.....	112	3,745,759	544,416.52
Shoshone.....	4.29	6.74	3	159,350	73,350.98
Yuma.....	5.80	.....	1	185,000	73,429.47
Total.....	149.48	8.68	31	5,813,388	1,065,603.79

¹ Excavation does not include backfill.

² Cost includes excavation, structures, right of way, and overhead expenses.

³ To June 1, 1919.

⁴ Includes 1 contract machine.

It will be noted that 31 excavating machines were operated, 30 by the Reclamation Service and 1 by contract, and that approximately 149½ miles of open drains and 8.7 miles of closed drains were constructed during the year. The largest drainage program is being carried on on the Rio Grande project, New Mexico-Texas, where during the year 76 miles of open drains were constructed and 12 excavating machines were in operation. Important drainage work was also carried on on the Grand Valley project, Colorado, and the Boise project, Idaho.

The following table gives an estimate of the seepage condition and the total results accomplished up to June 30, 1919:

Estimate of seepage and summary of drainage to June 30, 1919.

Project.	Constructed drains.		Estimated area damaged by seepage on June 30, 1919.	Estimated area protected by constructed drains.	Estimated area that will be protected when all drains authorized have been constructed.
	Open.	Closed.			
Arizona-California:					
Yuma—	<i>Miles.</i>	<i>Miles.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Bard and Indian	11.70	4.00	1,500	8,000	8,000
Yuma Valley	15.30	.....	4,500	20,000	50,000
Colorado:					
Grand Valley	1.70	.....	400	150	200
Grand Valley drainage district	18.30	1.60	30,000	5,000	10,000
Uncompahgre .....	.....	.....	16,000	.....	.....
Idaho:					
Boise—					
Riverside and Big Bend	17.60	.....	3,000	4,500	10,000
Pioneer irrigation district	78.50	.40	300	30,000	30,000
Nampa Meridian district	43.70	.....	350	50,000	50,000
Other parts of project	9.70	.....	3,000	3,500	3,500
King Hill .....	.30	.....	.....	600	.....
Mindoka (gravity unit)	109.00	.....	560	30,000	30,000
Montana:					
Flathead (Indian) .....	.18	2.97	440	1,240	1,240
Huntley	16.00	48.00	1,500	20,000	24,000
Milk River .....	.....	.....	1,500	.....	.....
Sun River (Fort Shaw) .....	.....	.....	2,250	.....	.....
Montana-North Dakota:					
Lower Yellowstone	4.50	1.10	1,500	1,600	1,600
Nebraska-Wyoming:					
North Platte (interstate)	38.70	14.20	3,250	6,780	7,960
Nevada:					
Newlands—					
Fallon division	10.87	3.99	11,900	14,700	18,900
Fernley division	3.45	.....	100	600	600
New Mexico:					
Carlsbad	11.14	3.65	5,000	5,500	5,500
New Mexico-Texas:					
Rio Grande .....	.....	.....	.....	.....	147,000
Mesilla Valley	69.20	.....	41,600	30,000	.....
Montoyo	6.60	.....	3,000	1,000	.....
El Paso Valley	49.90	.....	21,600	26,000	.....
Rincon Valley .....	.....	.....	14,500	.....	.....
Oregon:					
Klamath	83.90	8.00	6,200	23,400	25,600
Umatilla	10.00	.....	200	2,000	2,000
South Dakota:					
Belle Fourche .....	.....	.....	2,800	.....	.....
Washington:					
Yakima—					
Sunnyside	70.00	50.00	10,000	42,000	.....
Tieton	3.00	11.00	100	1,350	.....
Wyoming:					
Shoshone	18.00	82.00	1,450	24,000	37,000
Total	701.24	220.91	188,500	351,920	463,100

¹ Surface drains and waste ditches not included.

² Constructed by land owners.

The data relative to areas protected or to be protected by drains when completed are dependent on many factors. It is impossible in advance of complete irrigation over a given area to foretell with certainty what portion may become seeped and waterlogged. The amount of water used and the manner in which it is applied to the soil are important factors in influencing the spread of seepage. These are dependent upon the care and skill of the irrigator. The natural drainage of different soils can be only roughly approximated yet it is of great importance in preventing the rise of ground water. On account of these and other equally undeterminable factors, the results given in this table should be regarded as expressions of opinion rather than accurate engineering determinations. The tabulation of drains constructed to June 30, 1919, given in this table, shows the growing importance of drainage work and it will be noted that a total of approximately 922 miles of open and closed drains have been constructed to date to protect and reclaim lands from seepage which have been placed under irrigation by the Reclamation Service.

POWER DEVELOPMENT.

In connection with the investigation of secondary projects, several power sites were investigated during the year and tentative plans made for their development. It is apparent that the development of hydraulic power for irrigation pumping will play an increasingly important part in future projects. The continued satisfactory operation of the large Minidoka South Side pumping unit and of other pumping systems furnishes ample evidence of the reliability of this method of water supply.

Power development actually in progress during the year was confined to the completion of plants already under construction and minor extensions and improvements to existing power systems.

The following tables show power and pumping plants installed on various projects and the results of operation for the fiscal year.

Power plants operated by the United States Reclamation Service, fiscal year 1918-19.

Project.	Name of plant.	Type of generating units.	Station capacity, units.	Number of units.	Head, feet.	First cost of plant.	Output, kilowatt-hours.	Cost per kilowatt-hour, without depreciation.	Cost per kilowatt-hour, with depreciation only.	Distribution of power generated (kilowatt-hours).					Gross income from power sales.
										Sold to consumers.	Used for irrigation pumping.	Used for construction.	Camp for lights, etc.	Used for drainage work.	
Salt River 1.	Roosevelt.	Hydroelectric.	Kc-a, 10,300	6	80-225	\$557,559.86	32,467,100	0.00182	0.00086						
	Crosscut.	do.	5,250	6	111	480,454.60	10,059,400	0.00275	0.00238						
Boise ²	South Consolidated.	do.	2,000	2	31	162,123.05	5,165,900	0.00190	0.00157	39,977,020	4,424,543,106	390,120,000			5,701,277
	Arizona Falls.	do.	1,050	2	19	109,500.73	2,636,820	0.00307	0.00208						
Minidoka.	Boise.	do.	1,875	3	30	167,905.37	6,220,500	0.00351	0.00294	5,302,798		6,133	63,688	847,821	11,027,50
	Minidoka.	do.	7,000	5	48,32	455,317.40	50,331,340	0.00351	0.00294	23,288,258	22,139,985		841,581		78,673.89
North Platte ³ .	Lingle.	do.	750	2	105	80,000.00	211,570	0.0137	0.00236			62,900	30		4,061,516
	Lahontan.	do.	1,875	3	110	138,511.52	6,572,110	0.0137	0.00236	6,539,648			32,462		4,148,640
Newlands ⁴ .	Elephant Butte	do.	187	1	177.81	8,440.00	25,990	0.0689		81			25,909		21,337.48
	Power Plant No. 2.	Steam electric.	1,150	4		288,699.39	2,136,033	0.0254	0.0014	1,496,197	193,151		357,777		7.83
Strawberry Valley.	Spanish Fork.	Hydroelectric.	850	2	125	59,849.05	941,780	0.0165	0.00411	854,420			33,810		88,908,738,838.19
	Okanogan.	do.	187	1	108	11,923.44	32,900	0.0163	0.0164						53,550
Yakima Storage ⁵ .	Teton No. 1.	do.	270	1	55	13,931.42	35,980	0.0135	0.0168		32,900				783.14
	Rocky Ford.	do.	187	1	73	23,000.00	502,300	0.004	0.0021		35,980				391.57
Yakima Sunnyside ⁶ .	Power Plant No. 2.	do.	270	1	45	40,000.00	69,000	0.012	0.0102						10,000
	Rocky Ford.	do.	187	1	73	23,000.00	502,300	0.004	0.0021		502,300				

¹ System taken over by water users Nov. 1, 1917.

² Leased to Electrical Investment Co. for 5 years beginning May 16, 1916.

³ Plant put into operation May 1, 1919.

⁴ Includes losses in water rheostat.

⁵ Power plant and transmission line leased to Canyon Power Co. for 10 years beginning Dec. 1, 1914.

⁶ Average.

⁷ Does not include proportion of water payments for energy used for pumping in June.

⁸ Plant operated during July and August 1918, only.

⁹ Operated by irrigation district.

Pumping plants operated by the United States Reclamation Service during fiscal year 1918-19.

Project.	Name of plant.	Type of pumping unit. ¹	Plant capacity.	No. of units.	Net lift.	First cost of plant.	Energy used for pumping.	Acre-feet pumped.	Cost per acre-foot including operation and maintenance and depreciation.	Cost per acre-foot with operation and maintenance and depreciation.	Remarks.
Salt River ²	Battery 1 (A).....	V. M. D. C.	75	1	49.0	\$16,425.49	Kilowatt-hours.	1,791.43	\$1.66	\$0.084	Fourth unit started April, 1919. First operated in June, 1919. Operation started April 14, 1919.
	Battery 2 (B).....	do.	75	1	46.2	20,603.87	165,987	3,479.08	.77	.067	
	Battery 3 (C).....	do.	75	1	48.4	16,734.94	262,622	3,411.83	.70	.045	
	Battery 4 (D).....	do.	75	1	46.5	19,333.12	305,473	4,206.87	.57	.022	
	Battery 5 (E).....	do.	75	1	44.5	21,848.29	279,013	3,767.45	.63	.042	
	Battery 6 (F).....	do.	75	1	32.0	16,808.09	296,256	4,097.88	.55	.0172	
	Clemans.....	H. M. D. C.	100	1	31.0	7,492.80	270,562	3,304.70	.90	.0280	
	San Francisco.....	do.	100	1	30.0	28,975.94	53,235	684.50	6.53	.217	
	McQueens.....	V. M. D. C.	75	1	50.0	17,254.44	264,130	2,831.11	2.04	.0408	
	Hughline lift.....	H. M. D. C.	650	4	47.0	68,656.88	2,241,430	31,419.24	.413	.0088	
Yuma.....	5 South Side pumping plants.....	V. M. D. C.	35	5	17,936	4200	Fourth unit started April, 1919. First operated in June, 1919.
	Reservation drainage.....	G. E. D. C.	110	2	5.6	6,775.60	.....	500	1.03	.185
	Valley pumping.....	do.	40	1	4.5	900.00	.....	450	1.42	.315
Grand Valley.....	Valley drainage.....	G. E. D. S.	100	2	8-16	120,526.78	7,551	.99	.062	Operation started April 14, 1919.
	Price-Stub.....	V. T. D. C.	125	1	31	47,600.12	.....	2,622	.38	.023
	Pumping station No. 1.....	V. M. D. C.	270	5	28.7	182,920.77	8,496,877	197,094	.....	.....
Mindoka.....	Pumping station No. 2.....	do.	240	4	30.4	181,845.30	13,693,108	159,675	Type S. T. D. C.—steam turbine-driven centrifugal pump. Type G. E. D. S.—gas-engine-driven centrifugal pump.
	Pumping station No. 3.....	do.	1,560	3	29.5	101,395.61	385,600	93,881	.....	.....
	West End.....	H. M. D. C.	150	2	21.25	18,745.61	385,600	9,144	.....	.....
	A-4 raise.....	do.	5	1	4	1,098.76	5,082	557	.....	.....
	1812 pumping station.....	Scoop wheel	25	1	3.5	3,328.42	24,700	2,710	.....	.....
	1817 pumping station.....	do.	10	1	4.8	3,634.71	11,620	1,034	.....	.....
	114 pumping station.....	H. M. D. C.	75	1	7	2,803.97	13,320	610	.....	.....
	Boersach Lake.....	V. M. D. C.	200	2	19.79	32,947.73	431,320	11,450	.....	.....
	
	

¹ Type V. M. D. C.—vertical motor-driven centrifugal pump. Type H. M. D. C.—horizontal motor-driven centrifugal pump. Type S. T. D. C.—steam turbine-driven centrifugal pump. Type V. T. D. C.—vertical hydraulic-turbine-driven centrifugal pump. Type G. E. D. C.—gas-engine-driven centrifugal pump. Type G. E. D. S.—gas-engine-driven screw pump.

² Operated by Irrigation district.

³ Each.

⁴ Estimated.

⁵ Average.

Pumping plants operated by the United States Reclamation Service during fiscal year 1918-19—Continued.

Project.	Name of plant.	Type of pumping unit.	Plant capacity.	No. of units.	Net lift.	First cost of plant.	Energy used for pumping.	Acre-feet pumped.	Cost per acre-foot including operation and maintenance and depreciation.	Cost per acre-foot with operation and maintenance and depreciation.	Remarks.
Huntley.	Ballantine.	V. T. D. C.	Horse-power. 596	2	44.6	\$71,522.30	Kilowatt-hour.	5,084	\$0.58	\$0.0125	Part of power plant.
	Ballantine auxiliary.	G. E. D. C.	364	2	44.6	66,703.98	.....	1,920	2.85	.064
	Pumping station No. 1 (E and D).	S. T. D. C.	490	3	21.6	.....	.....	581	.....	.....
	Pumping station No. 2 (A).	H. M. D. C.	175	2	26.6	14,065	45,883	639	.....	.....
	Pumping station No. 3 (Barge).	do.	405	3	18	39,647	82,773	1,728	.....	.....
Okanogan.	Pumping station No. 4 (B).	do.	100	1	27.75	8,821	18,982	273	Extensive repairs during year.
	Robinson Flat.	do.	200	2	188	30,077.24	68,880	202	18.07	.096	
	Salmon Lake.	G. E. D. C.	125	1	15	7,747.81	.....	1,871	4.53	.302
	Duck Lake.	do.	150	1	50	.....	.....	586	6.50	.13
Yakima: Sunnyside.	Snipes Mountain.	V. T. D. C.	550	2	200	48,500	5,800	.72	.0036	Temporary plant. Depreciation not included; construction 50 per cent complete.
	Hillcrest.	do.	35	1	103	5,800	.....	448	1.22	.0118
	Outlook.	do.	800	2	110	92,000	.....	17,080	.31	.0028
	Grandview.	V. T. D. C.	214	1	78	72,500	502,300	9,542	.98	.0142	
	Prosser.	H. M. D. C.	175	2	35	54,153	.....	285	.....	.....
	Spring Creek.	H. T. D. C.	190	1	105	.....	.....	811	.....	.....
		do.	160	1	90	46,353	Put in service May, 1919; plant cost not final. Do.

Contracts for sale of power in force June 30, 1919.

Project.	Name of contractor.	Date of contract.	Date of expiration.	Maximum load.	Rate per kilowatt hour.	Gross income, fiscal year 1918-19.	Remarks.
Minidoka 1	City of Hurley	Apr. 21, 1910	Apr. 21, 1920	Kilowatts. 240 3,000	0.5 to 2.7 cents	\$25,874.82	Heat, 50 to 75 cents per kilowatt per month.
	Rupert Electric Co.	Mar. 16, 1910	Mar. 16, 1920	100-200	do.	14,060.43	Do.
	Paul Electric Co.	Jan. 11, 1917	Feb. 13, 1924	2,000	Standard	5,684.28	
	Village of Albion	Oct. 15, 1915	Jan. 8, 1926	50 and 150	do.	4,500.36	
	Malcher Mining & Milling Co.	July 27, 1917	July 27, 1922	100	do.	3,675.11	
	Minidoka Irrigation District.	Dec. 2, 1916	Dec. 2, 1926	200	0.3 cent.	2,614.93	
	Village of Albion	Sept. 18, 1916	Jan. 8, 1926	(?)	See remarks.	1,660.50	Heat only, at \$1.75 per kilowatt per month.
	Amalgamated Sugar Co.	Oct. 16, 1912	Dec. 21, 1922	25 and 170	Standard	1,737.92	Heat, 50 and 75 cents per kilowatt per month.
	E. B. Skinner	Mar. 9, 1910	Mar. 9, 1920	1,500	0.5 to 2.7 cents	1,463.16	
	Unity Light & Power (Ltd.)	Mar. 19, 1917	Mar. 19, 1927	7	Standard	1,437.32	
	Schodde Electric Co.	May 24, 1915	June 28, 1925	10	do.	884.94	
	Burley Milling & Elevator Co.	Oct. 2, 1915	Nov. 5, 1920	10	do.	769.41	
	Riverside Electric Co.	Feb. 15, 1918	Feb. 15, 1928	15	do.	515.59	
	Rural Electric Co.	Apr. 1, 1919	Mar. 31, 1927	15	do.	473.16	
	East End Mutual Electric Co. (Ltd.)	Jan. 23, 1918	Jan. 23, 1928	15	do.	415.41	
	Deelo Light & Power Co. (Ltd.)	May 24, 1918	May 4, 1928	10	do.	414.32	

1 Minidoka standard rates for electric light and power:

For 50 hours' use of maximum demand.	per month per kilowatt.	\$2.00	Next 150 hours' use of maximum demand	per kilowatt-hour.	\$0.01
Next 50 hours' use of maximum demand.	per kilowatt-hour.	.03	Balance hours' use of maximum demand.	do.	.005
Do.	do.	.02			

(Above rates increased 25 per cent during June, July, and August.)

Above rates subject to discount for maximum demand of—

	Per cent.		Per cent.
2 kilowatts and less than 4 kilowatts.	2	Above rates subject to discount for maximum demand of—Continued.	
4 kilowatts and less than 7 kilowatts.	4	35 kilowatts and less than 41 kilowatts.	18
7 kilowatts and less than 11 kilowatts.	6	41 kilowatts and less than 49 kilowatts.	20
11 kilowatts and less than 15 kilowatts.	8	49 kilowatts and less than 57 kilowatts.	22
15 kilowatts and less than 19 kilowatts.	10	57 kilowatts and less than 67 kilowatts.	24
19 kilowatts and less than 24 kilowatts.	12	67 kilowatts and less than 80 kilowatts.	26
24 kilowatts and less than 29 kilowatts.	14	80 kilowatts and less than 100 kilowatts.	28
29 kilowatts and less than 35 kilowatts.	16	100 kilowatts and over.	30

Minimum payment shall not be less than \$1.80 per month per kilowatt of the contractor's agreed maximum demand. All rates subject to 10 per cent discount if energy is delivered and metered at approximately 2,200 volts or more, or 8 per cent if delivered at 2,200 or more volts and metered at a lower voltage.

1 Pumping requirements.

Contracts for sale of power in force June 30, 1919—Continued.

Project.	Name of contractor.	Date of contract.	Date of expiration.	Maximum load.	Rate per kilowatt hour.	Gross income, fiscal year 1918-19.	Remarks.
Minidoka—Continued.	Central Electric Co.	Mar. 12, 1918	Mar. 12, 1928	Kilowatts.	Standard.	\$304.00	
	Minidoka North Side Power Co.	Apr. 1, 1913	Sept. 2, 1923	10	do.	297.98	
	Minidoka Irrigation District.	Jan. 27, 1917	Apr. 4, 1927	2 and 8	do.	241.73	
	Acequia Dairy & Produce Co.	Mar. 1, 1916	May 19, 1926	1 and 23	do.	163.69	
	Fruitland Drive Power & Light Co.	Oct. 22, 1917	Oct. 22, 1927	2	do.	125.61	
	Farmers Electric Co. (Ltd.)	June 1, 1914	June 29, 1924	2	do.	122.42	
	R. F. Ray.	Apr. 1, 1918	Apr. 1, 1928	1 and 3	do.	120.76	
	Ferry Light & Power Co.	Mar. 12, 1919	Mar. 12, 1929	15	do.	108.73	
	Geo. W. Curtis.	Oct. 18, 1917	Oct. 18, 1927	1 and 5	do.	104.19	
	West End Power Co. (Ltd.)	June 18, 1917	June 18, 1927	3	do.	86.62	
	West Budge Power & Light Co.	Feb. 1, 1919	Feb. 1, 1929	5	do.	64.34	
	North Heyburn Electric Co. (Ltd.)	Jan. 12, 1918	Jan. 12, 1928	2	do.	63.49	
	Lancey J. Camp.	Nov. 2, 1917	Nov. 2, 1927	1 and 5	do.	60.46	
	E. C. Holley.	Oct. 21, 1914	Sept. 3, 1925	1 and 4	do.	57.68	
	Mathias Christien.	Oct. 21, 1914	Jan. 2, 1925	1	do.	50.26	
	Noah C. Lowry.	Nov. 23, 1913	Dec. 11, 1923	1 and 5	do.	44.10	
	Thomas B. Anderson.	Oct. 21, 1914	Jan. 2, 1925	2	do.	40.68	
	W. A. Drew.	do.	do.	1	do.	37.66	
	James H. Handy.	Oct. 13, 1917	Oct. 13, 1927	1	do.	37.64	
	Isaac E. Holmes.	Aug. 16, 1918	June 6, 1927	1 and 4	do.	37.34	
	Walcoff Electric Co.	Feb. 17, 1919	Feb. 17, 1929	1 and 2	do.	36.81	
	Abner W. Wallihan.	Nov. 28, 1917	Nov. 28, 1927	1 and 2	do.	33.55	
	J. R. Cattell.	Sept. 28, 1914	Oct. 12, 1924	1	do.	29.22	
	Lee St. Clair.	Sept. 18, 1915	Sept. 26, 1925	1	do.	27.50	
	C. W. Foster.	Jan. 1, 1918	Jan. 1, 1928	1	do.	26.90	
	D. A. Paured.	Apr. 9, 1918	Apr. 9, 1928	1	do.	25.86	
	Ernest J. Hansen.	Oct. 1, 1914	Jan. 13, 1925	1	do.	25.00	
	A. F. Ames.	Oct. 21, 1914	Jan. 2, 1925	1	do.	24.38	
	James H. Lewis.	do.	do.	1	do.	22.82	
	George B. Flynn.	July 3, 1918	Feb. 9, 1920	1	do.	22.59	
	W. A. Nelson.	June 15, 1917	June 15, 1927	1	do.	22.20	
	E. B. Schrock.	Dec. 1, 1917	Dec. 1, 1927	1	do.	21.92	
	Charles Swenson.	June 6, 1917	June 6, 1927	1	do.	21.91	
	C. F. Yahn.	Dec. 21, 1917	Dec. 21, 1927	1	do.	21.83	
	Irl G. Clayville.	Oct. 21, 1914	Jan. 2, 1925	1	do.	21.42	
	Harvey Moncur.	Sept. 16, 1914	Oct. 9, 1924	1	do.	21.38	
	Frederick Lorse.	Nov. 26, 1917	Nov. 26, 1927	1	do.	21.07	
	Arthur Bros.	Nov. 1, 1917	Nov. 1, 1927	1	do.	20.01	
	E. I. Hollenbeck.	Oct. 21, 1914	Jan. 2, 1925	1	do.	20.01	
	John D. Hunsinger.	do.	do.	1	do.	20.01	
	S. C. Sorenson.	Mar. 14, 1918	Mar. 4, 1928	1	do.	20.01	
	Louis L. Yates.	Dec. 26, 1917	Dec. 26, 1927	1	do.	20.01	

Canceled June 1, 1919.

Joseph Arnold.....	Oct. 22, 1918	Oct. 22, 1928	1	do	10.00	Service not connected; pays minimum guaranty.
W. M. Jordan.....	Dec. 8, 1915	Jan. 3, 1926	1	do	14.75	
W. A. Gill.....	Oct. 18, 1915	Jan. 11, 1926	1	do	14.15	
F. W. True.....	Oct. 12, 1915	Jan. 3, 1926	1	do	14.08	
C. P. Warden.....	Oct. 21, 1918	Oct. 21, 1928	1	do	13.25	
Mathews Bros.....	Apr. 1, 1919	Jan. 31, 1927	2	do	13.05	
H. Lundgren.....	Oct. 22, 1918	Oct. 22, 1928	1	do	13.04	
Emerson School District.....	May 1, 1919	May 1, 1929	1	do	2.99	
C. A. Brewerton.....	June 1, 1919	June 1, 1929	1	do	2.50	
Idaho Power Co.....	May 1, 1916	May 1, 1921	None.	0.35 cent.	11,000.00	Lease of Boise power plant.
Canyon Power Co.....	July 10, 1914	Nov. 30, 1924	1,500	1 to 1 cent.	21,138.66	Lease of Lahontan power plant.
City of Williston, N. Dak.....	Dec. 20, 1912	Dec. 20, 1922	600	2 1/2 to 4 1/2 cents.	38,838.19	Revised rates effective from Jan. 1, 1919.
Strawberry Valley 1.....	Feb. 5, 1919	Feb. 5, 1922	150	Standard.	5,519.74	Rate per kilowatt-hour based on maximum demand.
City of Payson.....	do	do	120	do	4,872.70	Do.
Town of Salem.....	do	do	40	do	897.13	Do.
City of Springfield.....	June 21, 1917	July 26, 1920	125	1 to 2 cents.	758.80	Minimum monthly charge \$50.
Joseph Lucas.....	Feb. 21, 1919	Feb. 21, 1922	5	9 cents	36.00	
Mapleton Light & Power Co.....	May 31, 1919	May 31, 1924	5	Standard.	10.50	Rate per kilowatt-hour based on maximum demand.
Springville Canning Co.....	June 19, 1914	June 19, 1924	5	do	18.00	Do.
Okanogan.....	May 10, 1917	May 10, 1920		\$10 per day.		90 days minimum.

1 Strawberry Valley standard rates for electric light and power:

Schedule of rates.—The kilowatt-hours of energy received by the contractor during any calendar month shall be paid for on the basis of the maximum demand during that month and as follows:

For the first quantity of energy actually used which, stated in kilowatt-hours, is equal to or less than the product of the maximum demand in kilowatts multiplied by 25 (hours), 6 cents per kilowatt-hour.

For the next quantity of energy actually used which, stated in kilowatt-hours, is equal to or less than the product of the maximum demand in kilowatts multiplied by 25 (hours), 4 cents per kilowatt-hour.

For the next quantity of energy actually used which, stated in kilowatt-hours, is equal to or less than the product of the maximum demand in kilowatts multiplied by 50 (hours), 3 cents per kilowatt-hour.

For the next quantity of energy actually used which, stated in kilowatt-hours, is equal to or less than the product of the maximum demand in kilowatts multiplied by 50 (hours), 2 cents per kilowatt-hour.

For the next quantity of energy actually used which, stated in kilowatt-hours, is equal to or less than the product of the maximum demand in kilowatts multiplied by 150 (hours), 1 cent per kilowatt-hour.

For the balance of the energy actually used, 1/2 cent per kilowatt-hour.

Demand discounts.—The rate stated in the above schedule will be subject to a discount based on the contractor's maximum demand, as shown in the following table:

TABLE OF DISCOUNTS.

For a maximum demand of—	Per cent.
15 kilowatts and less than 20 kilowatts.....	1
20 kilowatts and less than 30 kilowatts.....	2
30 kilowatts and less than 40 kilowatts.....	3
40 kilowatts and less than 50 kilowatts.....	4
50 kilowatts and less than 60 kilowatts.....	5
60 kilowatts and less than 70 kilowatts.....	6
70 kilowatts and less than 80 kilowatts.....	7
80 kilowatts and less than 90 kilowatts.....	8
90 kilowatts and less than 100 kilowatts.....	9
100 kilowatts and over.....	10

Voltage discount.—The monthly bill, after applying discounts stated in article 6, will be subject to a further discount of 10 per cent if the energy is delivered and metered at approximately 10,000 or more volts, or 8 per cent if delivered at approximately 10,000 or more volts and metered at a lower voltage.

UNDEVELOPED POWER.

In the following table are listed the power sites more or less completely investigated by the Reclamation Service but which have not been developed. The data given are necessarily, in most cases, only roughly approximate.

Undeveloped water power.

Project.	Name of plant.	Head.	Horsepower.
		<i>Feet.</i>	
Arizona-California:			
Yuma.....	Drop in California Canal.....	10	1,200
Do.....	Araz.....	22	9,000
Do.....	Laguna Dam (doubtful).....	9-18	4,000
California:			
Iron Canyon.....	Iron Canyon.....	60-130	35,000
Orland.....	Drop, high line to South Canal.....	27	678
Pit River.....	Hat Creek.....	200	9,000-12,000
Do.....	Fall River.....	70-400	7,000-40,000
Do.....	Big Bend.....	800-900	150,000
Colorado:			
Grand Valley ¹	Main Canal.....	31-48	3,000
Uncompahgre ¹	Various sites.....	18-160	40,000
Idaho:			
Boise.....	Arrowrock Dam.....	60-230	10,000-20,000
Do ¹	Various sites.....	20-90	1,900
Minidoka.....	Minidoka Dam.....	46	10,000
Do.....	Head of Walcott Lake.....	46	30,000
Montana:			
Flathead (Indian).....	No. 1 Newell Tunnel.....	169	130,000
Do.....	No. 2 Buffalo Dam.....	48	33,000
Do.....	No. 3.....	24	19,000
Do.....	No. 4.....	88	70,000
Do.....	No. 5.....	19	15,000
Huntley.....	Second drop, main canal.....	41	278
Montana-North Dakota:			
Lower Yellowstone ¹	Lateral K. K. drop.....	34	314
Nebraska:			
North Platte ¹	Pathfinder Dam.....	60-200	17,000-60,000
Nevada:			
Newlands.....	Lahontan.....	120	5,000
Do.....	26-foot drop.....	26	2,900
New Mexico-Texas: Rio Grande.	Elephant Butte Dam.....	65-185	12,000
Oregon:			
Columbia River.....	Celilo Falls.....	45-105	500,000-900,000
Deschutes.....	4 sites.....	65-110	90,000-100,000
Silver Lake.....	Silver Creek.....	48-120	2,900
Umatilla.....	Drainage outfall.....	28	145
Warner Valley.....	Deep Creek.....		2,000
Willamette Valley.....	Saniam River and Marion Lake.....		14,000
Do.....	McKenzie River, 2 plants.....	415-550	30,500
Do.....	Middle Fork, Willamette and Waldo Lake Storage.....	24,400	65,000
Oregon-California: Klamath.	Various sites.....	21-88	10,000
Utah: Strawberry Valley.....	Spanish Fork.....	126	1,500
Washington:			
Columbia River.....	Priest Rapids.....	60	200,000
Okanogan.....	Salmon Creek No. 1.....	347	2,000
Do.....	Salmon Creek No. 3.....	441	2,550
Yakima-Sunnyside.....	Mabton.....	44	131
Do.....	Main Canal.....	54	276
Yakima-Tieton.....	Lateral E.....	100	3,410
Yakima-Wapato.....	Drop 0.....	24	2,930
Do.....	Drop 1.....	40	4,083
Do.....	Drop 2.....	32	2,443
Do.....	Drop 3.....	34	1,488
Wyoming: Shoshone.....	Shoshone.....	200	40,000
Total.....			1,506,300-1,954,300

¹ Power from irrigation flow only.² Several stages.

ELECTRICAL AND MECHANICAL ENGINEERING.

In addition to routine duties, the electrical and mechanical division of the Denver office accomplished the following work during the fiscal year ending June 30, 1919:

Arizona-California, Yuma project.—The Yuma Valley drainage pumping plant was tested to determine its capacity and fuel economy.

Colorado, Grand Valley project.—The designs of the Price Stub pumping plant were completed and after completion of construction work the direct pumping unit was tested for efficiency and capacity with very satisfactory results.

Idaho, Minidoka project.—Plans for a 10,000-kilowatt extension of the Minidoka power plant were made, but construction work was postponed on account of the war. The commercial power situation was given careful consideration in view of the early expiration of the power contracts with the towns of Rupert, Heyburn, and Burley, and specifications for new contracts were prepared. One bid was received but no award had been made at the end of the fiscal year.

Nebraska-Wyoming, North Platte project.—Plans and specifications were prepared for repairs to the outlets of the Pathfinder Reservoir and for the installation of two additional regulating outlets to be connected with the north tunnel. The designs of the new outlets provide for plugging the tunnel and constructing concrete lined water passages to the face of the cliff where balanced needle valves of special design will be installed to discharge freely into the canyon below the dam. Emergency gates immediately above the needle valves will provide for inspection and repair of the regulating valves and protection against freezing during the nonirrigation season. The Lingle power plant was placed in operation and tested with satisfactory results in April, 1919. A contract for the delivery of power to the town of Torrington for commercial distribution was negotiated and assistance given the town in the purchase of equipment for receiving the power from the Government line. Assistance was given in the arrangement and construction of Government telephone circuits for the project and in the drawing of contracts with the local telephone company for switching service.

New Mexico-Texas, Rio Grande project.—Designs were made and material purchased for replacing worn parts and improving the operation of the balanced valves at the Elephant Butte Dam. Further studies are in progress of the possibilities of developing power at Elephant Butte, and at various sites along the proposed high-line canal.

North Dakota, North Dakota pumping project.—Assistance was given in revising the power contract with the city of Williston and in negotiations for the sale of additional power from the steam plant. Repairs preparatory to the operation of the pumping plants during the season of 1919 were made and assistance given in securing plant operators during the epidemic of influenza.

Utah, Strawberry Valley project.—As a result of conferences with the representatives of the project towns, new contracts were executed with Payson, Spanish Fork, and Salem, providing for the delivery of power for retail distribution at the standard rates adopted for the Strawberry Valley project. Power is also being sold to a company of farmers on Mapleton Bench and to the Springville Can-

ning Co. at the same rates. The gross income from the sale of power has been considerably increased by the new contracts, and the power system is now considered to be on a self-supporting basis.

Washington, Okanogan project.—In connection with the investigation of supplemental water supply, studies were made of several new pumping plants, and various plans for operating the present power system. Consideration was given to plans for utilizing the transmission line for the delivery of power to adjacent farms.

Washington, Yakima project, Sunnyside unit.—The Prosser and Spring Creek direct pumping plants were placed in operation and tested with satisfactory results in April, 1919. The smaller unit in the Snipes Mountain pumping plant was fitted with a new pump runner to correct former deficiencies, and its performance now exceeds the contractors' guaranties. Settlement was made with the Platt Iron Works for direct pumping units installed at the Outlook plant.

Wyoming, Shoshone project.—The possibility of developing power at Shoshone dam for commercial use in the valley was studied.

Secondary projects.—In connection with the All American Canal project preliminary designs and estimates were made for three power plants with capacities of 19,000 horsepower, 18,000 horsepower, and 26,000 horsepower, respectively. Further studies were made of the power and pumping system for the Yuma Mesa Extension. The Orchard-Mesa pumping plant was studied with a view to adapting it to the new conditions of the proposed rehabilitation of the project. Revised estimates for the power and pumping plants for the Hillcrest extension of the Boise project, were prepared, and further study given to the possibility of supplying power to the Gem irrigation district from Arrowrock Dam. Extensive investigations of the power plants and sites along the Snake River, Idaho, were made in connection with the American Falls Reservoir project. Designs and estimates of numerous large power plants, pumping plants, and transmission lines were made for the Minidoka North Side pumping extension.

All projects.—Collaborating with the civil engineering division of the Denver office, a report on the experience of the Reclamation Service with large capacity reservoirs outlets is being prepared.

CEMENT TESTING WORK.

On July 1, 1917, the cement testing work for the Reclamation Service was turned over to the Bureau of Standards of the Department of Commerce. Prior to that date this work was handled by a cement expert employed by the service, and laboratories were maintained for this purpose at Denver and San Francisco.

The following table shows by years the number of barrels for which tests were made, and the amount and per cent accepted since January 1, 1904, when the testing laboratory was established, to June 30, 1917, when the work was turned over to the Bureau of Standards. The amount accepted during the fiscal years 1918 and 1919 is also given, but the per cent accepted can not be stated, as the testing was included in similar work handled for other departments, and segregation is impracticable.

Year.	Amount for which tests were made.	Accepted.	
		Amount.	Per cent.
Jan. 1, 1904, to June 30, 1906.....	Barrels. 160,044	Barrels. 146,602	91.6
Year ending June 30—			
1907.....	197,321	191,204	96.9
1908.....	147,554	137,526	93.2
1909.....	196,097	163,733	83.5
1910.....	140,293	127,743	91.1
1911.....	93,986	88,986	94.6
1912.....	160,553	149,303	92.9
1913.....	181,653	170,473	93.8
1914.....	404,885	391,135	96.6
1915.....	602,288	583,588	96.9
1916.....	171,213	168,213	98.2
1917.....	114,463	111,163	97.7
1918.....		60,980	
1919.....		39,671	
Total.....		2,530,320	

Regular sets of long-time tests have been continued. In the appendix will be found a table giving the average results of all tests on accepted cement from January 1, 1904, to June 30, 1919.

PURCHASE OF MATERIAL AND SUPPLIES.

Most of the important purchases for the service are made by the Denver office, where a purchasing department is maintained. The project offices purchase direct perishable foods, forage, and such other commodities as can be purchased locally to best advantage. By purchasing through the Denver office all projects get the benefits inherent in large-scale purchases, and in the purchase of materials of construction, the purchasing department of that office has the advantage of advice of the several engineers and technical departments.

The purchasing department has been handicapped during the past year by very adverse market and transportation conditions, many firms being unable to deliver materials with any degree of promptness.

During the fiscal year 1919 the total number of purchases was 5,038, with a total value of \$1,489,583.04, and the cash discounts earned by prompt payments of bills amounted to \$8,727.12, leaving a net amount of \$1,480,855.92 expended through this department. Government bills of lading numbering 3,777, were issued, covering the movement of freight, and 6,959 transportation requests were issued for travel of employees in the service.

The following comparative tabulation shows a summary of data covering purchases made during the past 10 years:

Fiscal year.	Number of purchases.	Gross amount.	Discount.
1910.....	1,774	\$504,023.60	
1911.....	1,607	574,323.74	
1912.....	2,205	990,018.53	
1913.....	2,735	459,990.17	\$4,288.29
1914.....	3,116	471,446.28	4,604.28
1915.....	2,854	454,661.46	3,842.09
1916.....	5,049	690,601.99	6,747.38
1917.....	4,989	1,095,830.36	13,000.25
1918.....	6,215	1,809,580.84	17,876.29
1919.....	5,038	1,489,583.04	8,727.12
Total.....	35,582	8,409,960.01	59,083.70

FREIGHT, PASSENGER, AND EXPRESS TRANSPORTATION.

On July 1, 1918, unsettled claims for transportation of freight and express amounted to \$53,699.59 and during the year new claims were filed for like service to the amount of \$351,142.22, making a total of \$404,841.81. Of these, \$322,074.45 were given administrative examination and forwarded to the Treasury Department, approved for payment, leaving \$82,767.36 outstanding, of which \$77,635.23 was with the railroads for correction.

At commercial rates the charges on freight and express shipments moved during the year would have amounted to \$534,880.94.

Passenger transportation claims to the amount of \$69,139.44 were examined and passed for payment.

Refund claims amounting to \$4,384.33 were filed with carriers on commercial shipments for contractors on United States Reclamation Service work, the amounts paid being covered into the reclamation fund.

The following table gives general data on freight and express transportation since 1906:

Fiscal year.	Bills settled.	Commercial charges.	Deducted account of contracts, land grant, and other causes.	
			Total.	Per cent.
1907.....	\$278,782.10	\$470,863.26	\$192,081.16	40.8
1908.....	369,583.04	577,830.42	208,247.38	36.0
1909.....	778,047.12	1,403,970.10	625,922.98	44.5
1910.....	437,032.61	758,808.76	321,776.15	42.4
1911.....	405,380.55	666,876.59	261,516.04	39.2
1912.....	610,740.23	1,055,733.27	444,993.04	42.1
1913.....	481,118.91	837,077.59	355,958.68	42.5
1914.....	547,705.99	927,163.49	379,457.50	40.9
1915.....	778,893.33	1,393,347.96	614,454.63	44.1
1916.....	471,606.52	817,481.33	345,874.81	42.3
1917.....	393,477.70	653,013.98	259,536.28	39.7
1918.....	324,562.28	608,479.63	283,917.35	46.6
1919.....	331,056.20	534,580.94	203,524.74	38.1
Total.....	6,207,966.58	10,705,227.32	4,497,260.74	42.0

LEGAL DIVISION.

The legal division of the service is in charge of the chief counsel, under whom are certain attorneys known as counsel, as well as various clerks and stenographers.

The work of the legal division in the Washington office includes the consideration of litigation, irrigation district organization, laws and legislation, departmental decisions and regulations, manual amendments, public notices, abstracts of title, contracts, etc.

There are eight main field offices of the legal division located respectively at Denver, Colo.; Montrose, Colo.; Mitchell, Nebr.; Helena, Mont.; Boise, Idaho; Portland, Oreg.; San Francisco, Calif.; and El Paso, Tex. There are also three suboffices in the field, located respectively at Billings, Mont.; Yakima, Wash.; and Fallon, Nev. The attorneys in charge of these offices are known as district counsel and are the legal advisers to the various project managers located within their respective districts.

In the central Denver office is located a district counsel who is legal adviser to the chief of construction. Also at Denver are located a district counsel in general charge of irrigation district organization and one in special charge of the work of passing on titles to land.

Several million dollars are at present involved in litigation directly connected with the Reclamation Service. The immediate supervision of litigated cases is in the Department of Justice, but the legal division of the service takes an active part in preparing and trying all such suits.

LITIGATION.

The following statement shows the general progress of litigation during the fiscal year:

Number of cases pending at beginning of year	73
Number of cases initiated during the year	20
Total	93
Number of cases disposed of during the year	20
Number of cases pending at the end of the year	73

LEGISLATION.

Copies of acts of Congress, passed during the fiscal year, affecting the Reclamation Service, will be found in the appendix.

LAW DECISIONS.

A digest of law decisions affecting the Reclamation Service, which have been rendered during the fiscal year, will be found in the appendix.

PUBLIC NOTICES AND ORDERS.

Copies of the public notices and orders issued by the Secretary in regard to reclamation payments, etc., during the fiscal year will be found in connection with the text relating to the respective projects.

PURCHASES OF RIGHTS AND PROPERTY.

A statement of the transactions for the acquisition of rights and property is given in the appendix.

PERSONNEL.

On June 30, 1919, the force of the Reclamation Service comprised 3,819 persons, subdivided as follows: Educational, 555; noneducational, 951; laborers, 2,313. In addition, the employees of contractors working on reclamation projects numbered 112. A more detailed statement, giving the administrative personnel of the service and the number of employees by projects, classified as above, will be found in the appendix.

Wages of labor.—A table in the appendix shows, by projects, the average daily wages paid for common labor in June and December for the past five years, and for June, 1919. As shown by this table, wages have increased from an average of about \$2.23 in June, 1914, to \$3.50 in June, 1919.

Injuries to employees.—Under the terms of the employees' compensation act of September 7, 1916, there have been 980 injuries

reported from the date of the passage of the act to June 30, 1919. Claims to the number of 453 have been allowed, and a total of \$40,040.57 has been paid to the claimants. A detailed statement, by projects, will be found in the appendix.

Inoculation with typhoid prophylactic and pneumonia and influenza vaccine.—During the fiscal year the service continued, in cooperation with the War Department, the use of typhoid prophylactic among the field force. Four hundred and thirty complete treatments were sent to the field, making a total since July, 1912, of 3,980. Supplies of pneumonia and influenza vaccine were also sent to the projects on request.

Employees in the military and naval service of the United States.—Employees of the Reclamation Service in the military and naval service of the United States during the war numbered 805. Of these, 7 were killed in action, 7 died of disease, 1 was reported missing, and 6 were wounded.

Liberty loans.—The employees of the service subscribed \$169,450 to the Victory Liberty loan, making a total subscription to the five loans of \$917,850. In addition, large numbers of war-saving stamps have been purchased.

FINANCES.

The financial condition of the service may be summed up in the following condensed statement of total receipts and expenditures.

The statement of cash receipts and payments appearing below shows that

At the beginning of the fiscal year there was \$1,680,589.05 cash on hand.

During the year this amount was augmented by receipts from various sources to a grand total of \$3,669,277.90.

Cash expenditures during the fiscal year were \$8,203,512.44.

Town-site receipts were \$55,362.49.

The balance on hand at the close of the fiscal year amounted to \$1,008,502.52.

Pursuant to Comptroller's decision of September 25, 1918, and Departmental approval of September 30, 1918, the General Land Office makes monthly statements of the amounts received from the sale of public lands and fees and commissions, from which the reclamation fund is derived and 80 per cent of the total of this statement is immediately transferred to the credit of the reclamation fund, thus making these receipts available without waiting for the final audit of receivers' accounts. Under this plan the amounts held in the division of public moneys, pending audit, are reduced to an amount, which it is estimated will be more than sufficient to cover repayments for lands erroneously sold and the 5 per cent State funds excepted by the act of June 17, 1902. Upon completion of audit, which is usually from six to nine months after the collection, the balance due the reclamation fund is made available.

The reclamation fund has received from the sale of public lands a total of \$97,426,574.56 and from the sale of town lots \$449,516.42. Under the provisions of the reclamation act this is made a revolving fund, so that the return of any portion of the investment is made available for reinvestment in other operations. The reclamation fund, therefore, can be compared with capital invested in any busi-

ness in commercial enterprises, and this authority to so use the fund makes possible the construction of works aggregating a cost greater than the amount of the original investment. All appropriations by Congress for reclamation-fund projects have been practically authorities for using the reclamation fund, as the acts have specifically provided that the amount to be expended for the service as a whole is limited to the available amount in the reclamation fund. It follows that the construction of new works depends upon the repayment of the cost by the projects or units of projects which have been completed, as but little is being added to the fund from original sources.

In all, 27 projects have been approved for construction, and on 19 of these public notices have been issued announcing the construction charges to be repaid by all or a portion of the area. Projects are sometimes opened by units, and while construction is proceeding on uncompleted units repayments are being made on completed ones.

The reclamation-extension act extended the time of repaying the cost of the works to a maximum of 20 years, in graduated payments, so the rate of turnover of capital is low, and without an increase in capital the progress of construction will be very slow.

Transfer vouchers, adjusting accounts between the projects for the transfer of the value of services and equipment, amounted to \$595,-509.40 during the fiscal year 1919. Since the beginning of the service the value of the transfers of supplies, materials, equipment, and services between projects has amounted to \$7,270,806.72. This system of transfers between projects has enabled the service to utilize equipment, materials, supplies, etc., to their fullest extent where needed and to charge the cost where the benefit accrued.

CASH TRANSACTIONS.

Below is shown, in the statement of cash receipts and payments, a summation of the cash transactions during the fiscal year 1919:

TABLE 1.—Statement of cash receipts and payments, reclamation fund, fiscal year 1919.

RECEIPTS.	
On hand July 1, 1918 (17th Ann. Rept., p. 40)	\$1, 680, 589. 05
Original receipts:	
Public land sales	\$3, 613, 915. 41
Town-sites sales	55, 362. 49
	3, 669, 277. 90
Repayments water-right charges	2, 632, 721. 19
Miscellaneous receipts:	
Sales	276, 106. 78
Services	322, 086. 23
Water rentals	527, 261. 73
Power and light	143, 069. 95
Transportation refunds	11, 871. 06
Forfeitures by bidders	20. 00
Over disbursements	4, 456. 22
Collections in project office not classified	95, 862. 59
Erroneous settlement by Treasury Department	327. 67
	9, 363, 644. 37
PAYMENTS.	
Reclamation fund	8, 203, 512. 44
Town-site receipts	55, 362. 49
Balance on hand June 30, 1919:	
In Treasury	\$460, 308. 55
Deposits to credit of special fiscal agents	548, 193. 97
Project offices in process of deposit	95, 862. 59
Erroneous settlement by Treasury Department	404. 33
	1, 104, 769. 44
	9, 363, 644. 37

ASSETS, LIABILITIES, RESERVES, AND CAPITAL.TABLE 2. — *Consolidated balance sheet, reclamation fund projects, June 30, 1919.*

Collections returnable to fund through Treasury.....		\$95,962.59
Inventory of materials and supplies on hand.....		1,740,280.80
Accounts receivable:		
Current accounts receivable.....	\$1,133,584.56	
Water-right charges unaccrued.....	55,636,409.99	
		56,769,994.56
Construction work contracted.....		288,366.53
Gross cost of construction.....	132,276,620.20	
Less revenues earned during construction.....	8,423,712.58	
Net cost of construction of projects.....		123,852,907.62
Gross operation and maintenance cost.....	8,509,194.27	
Less operation and maintenance revenue earnings.....	579,403.01	
Net operation and maintenance cost.....		7,929,791.26
Accounts payable.....		925,164.87
Contingent obligations.....		384,085.27
Collections and contracts for specific amounts for repayments to reclamation fund.....		70,259,057.73
Miscellaneous accruals.....		685,909.71
Capital investment:		
Disbursements and transfer and joint construction vouchers received.....	\$152,816,788.83	
Less collections, refunds, and transfer and joint construction vouchers issued.....	134,898,753.26	
Net investment.....		118,422,935.57

CONSTRUCTION COSTS BY FEATURES.

The statement which follows gives by features the cost of the construction of all storage works, canal systems, lateral systems, drainage and other protection systems, power systems, and other construction accounts of all projects, excluding the Blackfeet, Flathead, Fort Peck, and Riverton projects.

TABLE 3. — *Consolidated statement of construction costs and revenues.*

Feature.	Fiscal year 1919.	To end of fiscal year 1919.
COST.		
Examination and surveys.....	\$340,338.52	\$3,607,280.01
Storage works.....	775,343.42	33,006,909.09
Pumping for irrigation.....	102,831.33	1,324,809.09
Canal system.....	2,085,400.30	46,657,873.80
Lateral system.....	871,129.15	20,170,586.32
Drainage system.....	1,088,250.06	5,416,450.76
Flood protection.....	31,451.02	2,583,401.15
Power system.....	8,311.88	5,732,727.19
Farm units.....	49,375.96	596,903.88
Permanent improvements.....	54,278.65	2,800,898.33
Telephone system.....	30,170.26	490,020.77
Operation and maintenance during construction.....	499,088.05	7,129,208.73
Operation and maintenance compounded with construction.....	17,899.72	227,096.22
Total cost of construction features.....	6,053,868.42	130,044,329.80
Balance in plant accounts.....		1,917,517.72
Unadjusted clearing accounts.....		314,772.68
Gross construction cost.....	6,053,868.42	132,276,620.20
REVENUES.		
Rental of buildings.....	16,921.81	252,997.96
Rental of grazing and farming lands.....	13,619.65	204,226.49
Net power earnings (prior to public notice).....	259.92	1,037,050.33
Rental of irrigation water.....	512,672.04	5,126,156.17
Rental of telephone and tolls.....	45.40	7,463.00
Contractors' freight refunds.....	3,623.51	239,635.77
Other revenues, unclassified.....	15,942.09	1,553,426.37
Hospital operations, profit and loss.....	* 13,627.86	15,541.67
Railroad operations, profit and loss.....	1,533.85	3,900.21
Other operations, unclassified.....	62,949.96	* 16,685.39
Gross revenues.....	616,940.37	8,423,712.56
Net cost of construction.....	5,436,928.05	123,852,907.62

* This statement was compiled from project balance sheets and does not contain adjustments affecting Indian projects and some collections entered in Washington investment books which had not yet reached the project, explaining variance from Table 23, which includes all transactions in which the reclamation fund projects were involved.

* Deduct.

OPERATING COSTS AND REVENUES.

There follows a consolidated statement giving the costs and revenues for the operation of projects which have been opened by public notices of the Secretary of the Interior. These costs and revenues are those resulting from operations connected with the lands thrown open to water-right applicants by these public notices and do not include the transactions resulting from the temporary operation of canals during the construction period.

TABLE 4.—Consolidated statement of operating costs and revenues.

Item.	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage works.....	\$117,054.53	\$36,325.36	\$153,379.89	\$366,013.56	\$188,280.37	\$554,293.93
Pumping for irrigation.....	25,297.88	22,641.85	47,939.73	276,147.17	108,911.65	385,058.82
Canal system.....	91,017.50	248,556.91	339,574.41	583,149.30	1,395,049.99	1,978,199.29
Lateral system.....	262,766.36	658,008.71	920,775.07	1,372,960.72	2,944,899.06	4,317,859.78
Drainage system.....	4,277.00	21,087.26	25,364.26	16,615.37	88,064.27	104,679.64
Flood protection.....		65,789.31	65,789.31		78,730.71	78,730.71
Permanent improvements.....		7,866.02	7,866.02		24,237.02	24,237.02
Farming operations.....	73.08		73.08	140.67	710.71	851.38
Miscellaneous expense.....	9,865.61	67,244.43	77,110.04	64,680.54	218,336.36	283,016.90
Total costs.....	510,351.96	1,127,519.85	1,637,871.81	2,689,707.33	5,047,240.14	7,736,947.47
Less unpaid operation and maintenance charges added to construction.....			4,252.57			222,866.93
Balance.....			1,633,619.24			7,514,080.54
REVENUES.						
Operation and maintenance repayments under contracts with water users:						
Accrued charges.....			1,271,678.38			5,402,019.92
Advance payments.....			668.68			7,762.33
Forfeitures.....			3,918.86			17,199.42
Interest and penalties.....			15,961.66			44,086.97
Water rentals.....			36,230.96			421,114.65
Rentals of lands and buildings.....			13,061.28			60,287.05
Rentals of telephones and tolls.....			66.12			926.64
Other revenues, unclassified.....			8,787.97			31,074.36
Discounts (deduct).....			17,064.53			43,684.94
Total revenues.....			1,333,304.38			5,940,786.40
Difference—deficit.....			300,314.86			1,573,294.14

REPAYMENT CONTRACTS.

The development of the projects has resulted in water-right applications or contracts that have been entered into with settlers, irrigation districts, and associations, providing for repayment to the Government of the cost of constructing the works for irrigating their lands. These contracts, under provisions of the original reclamation law, and the reclamation extension act require complete repayment of construction charges in 10 and 20 annual installments, so graduated as to place upon the irrigator a minimum burden during the early years of farm development. On 19 projects the lands have been opened to entry and settlement and the construction charges fixed by public notice. Contracts with water-right applicants for

repayment to the reclamation fund of the cost of projects total, \$63,535,281.58. Of this amount there has been collected \$7,530,-878.19 of the charges, leaving the unpaid value of these contracts on June 30, 1919, \$56,004,403.39.

The contract value referred to does not include the lands on completed units which have not yet been specifically obligated by making water-right applications, and lands on uncompleted units of projects for which construction charges have not been announced. The security for the return of the portion of cost allocated to these lands is the general contract executed with water users' associations or irrigation districts prior to commencement of construction, pledging the land benefited to return the cost. A considerable portion of lands not contracted is public land on which the construction charge becomes a lien at time of entry.

There are still large acreages of land on most of the projects to which the service is now ready to furnish irrigation water and which are being taken up from day to day and new contracts signed. When all of the lands susceptible of irrigation are covered by contracts, the value of the contracts on any project should equal the amount of the net cost thereof. It is to be noted in this connection, however, that on several of the projects additional investment will be necessary to make all of the lands irrigable.

ESTIMATED COST OF CONTEMPLATED WORK.

It is estimated that the cost of construction and operation and maintenance during the fiscal year 1920 will aggregate \$6,424,761.21 for all projects, including, in addition to reclamation-fund projects, the Blackfeet, Flathead, Fort Peck, and Riverton projects appropriated for in the Indian bill. The total appropriation for reclamation projects is \$7,300,000 and for the Indian projects \$725,000. Expenditures for reclamation projects are limited to the amount available in the fund, which it is now estimated will be considerably less than the appropriation. The following table gives a tentative distribution to the various functional features of the estimated cost of work during fiscal year 1920:

TABLE 5.—*Consolidated statement of estimated cost of contemplated work during fiscal year 1920.*

1. Examination and surveys.....	\$115,509.78
2. Storage works.....	659,900.00
3. Pumping for irrigation.....	9,500.00
4. Canal systems.....	1,205,100.00
5. Lateral system.....	806,351.43
6. Drainage system.....	973,700.00
7. Flood protection.....	12,200.00
8. Power system.....	20,000.00
9. Farm units.....	30,000.00
10. Permanent improvements.....	65,700.00
11. Telephone systems.....	25,900.00
12. Operation and maintenance during construction (water rental).....	719,200.00
13. Operation and maintenance under public notice.....	1,649,600.00
14. Reimbursable accounts.....	57,100.00
15. Secondary projects.....	75,000.00
Total.....	6,424,761.21

GENERAL FINANCIAL DATA FOR ALL PROJECTS.

The following statement shows general financial data for all reclamation fund projects:

TABLE 6.—*General financial data for all reclamation fund projects.*

Net construction cost to June 30, 1919.....	\$123,852,907.62
Appropriation for fiscal year 1920.....	7,300,000.00

APPROPRIATION STATEMENT FOR FISCAL YEAR 1919.

Appropriation, fiscal year 1919.....	\$9,445,000.00	
Miscellaneous collections and transfers issued by projects.....	1,363,750.93	
Increased compensation.....	324,955.52	
Special appropriations.....	413,089.70	
Balance of fiscal year 1918 appropriation authorized for expenditure.....	995,733.80	
Total authorized for expenditure during fiscal year 1919.....		\$12,542,529.95
Disbursements.....	6,702,578.60	
Transfers received by projects.....	572,941.62	
Current liabilities.....	708,694.41	
Contingent liabilities.....	90,143.99	
Total incumbrance, fiscal year 1919.....		8,074,358.62
Unencumbered balance of funds authorized by appropriation act, fiscal year 1919.....		4,468,171.33

NOTE.—Expenditures under appropriations are limited to the amount in the reclamation fund for which reason full amounts authorized could not be utilized.

TABLE 7.—*Status of repayments to June 30, 1919.*

Project.	Construction charges.			Operation and maintenance charges.			Water-rental charges.			Power earnings.		
	Accrued.	Credits. ¹	Un- collected.	Accrued.	Credits. ¹	Un- collected.	Accrued.	Collected.	Un- collected.	Accrued.	Collected.	Un- collected.
Salt River.....	\$406,640.88	\$406,640.88		\$177,348.37	\$154,157.64	\$23,190.73	\$2,246,726.01	\$2,246,726.01		\$998,411.03	\$998,411.03	
Yuma.....	453,338.57	322,681.62	\$130,657.25	56,728.36			455,426.03	454,906.75	\$520.28			
Orland.....	59,437.57	59,437.57					119,870.22	119,800.22	270.00			
Grand Valley.....							43,465.95	39,753.13	3,742.82			
Uncompahgre.....							741,376.38	741,166.38	210.00			
Boise.....	502,848.63	455,730.51	47,118.12	208,827.54	171,660.28	37,158.26	677,654.83	671,427.10	6,227.73	82,794.56	82,794.56	
Minidoka.....	1,036,364.79	1,012,874.58	23,490.21	766,630.11	671,362.44	95,267.67	234,132.52	234,132.52		253,980.26	235,072.48	\$18,817.78
Huntley.....	300,948.84	296,031.39	4,917.45	205,205.54	190,260.96	14,944.58	2,631.95	2,404.11	227.84			
Milk River.....							46,157.71	45,576.76	580.95			
Sun River.....	115,328.60	111,951.14	3,377.46	81,391.94	75,509.14	5,882.80	1,478.50	1,223.50	255.00			
Lower Yellowstone.....	74,146.84	10,044.75	64,102.09	138,467.80	35,835.83	102,631.97	87,205.19	83,896.01	3,309.18			
North Platte.....	950,327.56	832,916.11	117,411.45	816,047.84	748,742.33	67,305.51	36,652.37	35,570.62	1,081.75			
Newlands.....	378,501.95	374,848.06	3,653.89	372,697.60	355,651.62	17,045.98	9,053.40	8,989.90	63.50	76,617.48	74,465.91	2,151.57
Carlsbad.....	221,963.30	207,958.79	14,006.51	240,308.89	227,609.98	12,698.91	14,483.23	14,424.28	58.95			
Hondo.....							9,192.09	9,037.50	154.59			
Rio Grande.....	8,863.18	8,863.18		24,278.91	12,964.28	11,314.63	644,016.27	559,285.30	84,730.97	173,931.51	170,958.46	2,973.05
North Dakota Pumping.....	332,826.11	318,492.33	14,333.78	157,056.97	131,742.74	25,314.23	2,948.58	2,149.03	795.55			
Umatilla.....	395,059.89	373,610.07	21,449.82	267,099.60	246,666.72	20,432.88	38,372.75	38,372.75	527.83	3,020.00	3,020.00	
Klamath.....	331,076.91	313,257.38	17,819.53	374,855.24	325,842.90	49,012.34	3,088.44	2,838.44	150.00			
Belle Fourche.....	127,249.66	120,665.90	6,583.76	64,392.43	62,347.98	2,044.45	5,213.89	5,213.89				
Strawberry Valley.....	34,130.06	31,894.75	2,235.31	70,711.26	47,960.98	22,750.28	106,196.82	102,178.00	4,021.82	40,231.79	38,277.75	1,954.04
Okanogan.....	515,504.40	514,894.40	700.00	31,904.08		26.05	21,792.50	21,194.50	598.00	1,754.71	1,754.71	
Yakima storage.....	914,307.76	865,118.15	21,189.61	855,933.34	834,498.43	21,435.91	46,441.05	46,276.73	161.32	1,766.13	1,766.13	
Yakima Sunnyside.....	483,400.31	461,074.72	22,325.59	310,226.41	290,266.49	19,960.92	6,216.50	6,216.50		1,866.20	1,866.20	
Shoshone.....	410,015.63	404,308.91	5,706.72	243,934.01	227,724.34	16,209.67	6,011.52	5,743.63	267.89			
Total.....	8,052,371.74	7,530,878.19	521,493.55	5,460,045.29	4,899,437.52	560,607.77	5,627,694.29	5,519,734.22	107,960.07	1,634,286.67	1,606,380.23	25,896.44

¹ Includes credits on account of contributed work and discounts allowed. Does not include advances, penalties, forfeitures, and refunds, which accounts for variation from corresponding figures in table 28, which covers cash collections only.

COST OF INVESTING THE RECLAMATION FUND.

In the thirteenth annual report there was for the first time presented a statement of the general expenses by calendar years showing the gross expenditures and the ratio of the general expense thereto. The figures shown for general expense were estimates based on partial returns from an investigation instituted to determine the ratio of general expense to all expenditures. These accounts, as presented in the thirteenth annual report, had been kept by calendar years, but owing to the change of policy involving annual appropriations by fiscal years, a readjustment of these accounts was immediately undertaken.

There is presented herewith a statement showing by fiscal years the gross cost from the reclamation fund and the actual total amount of general expense, together with the ratio of general to total cost. The results shown by this table differ somewhat from those given in the table of estimates presented in the thirteenth annual report. By reference to the table which follows it will be found that the average cost of investing \$100 in the construction and maintenance of the permanent works of the Reclamation Service has been \$8.90 during the past 17 fiscal years.

TABLE 8.—Statement showing by fiscal years costs of all operations by the Reclamation Service including general expense, the cost of general expense, and the ratio of general expense to all costs.

Fiscal year.	Cost.	General expense.	Per cent.
1907	\$22,243,606.12	\$1,762,585.75	7.92
1908	12,689,000.26	792,970.33	6.25
1909	10,156,837.05	887,484.08	8.74
1910	11,510,543.89	873,496.60	7.59
1911	9,214,154.59	897,501.27	9.73
1912	10,646,912.22	892,566.41	8.38
1913	8,281,316.74	958,443.72	11.57
1914	11,727,881.26	1,002,333.39	8.54
1915	15,329,977.09	1,058,909.24	6.99
1916	8,364,783.12	1,077,485.42	12.88
1917	7,198,840.75	1,080,303.78	15.006
1918	8,080,791.65	1,024,062.94	12.66
1919	8,608,522.28	862,046.74	10.01
Total	144,053,726.02	13,170,078.07	.....
Value of plant and equipment, clearing accounts, and general expense undistributed on June 30, 1919	2,318,666.65	.....	.....
Gross cost of all operations including Indian projects and operation and maintenance under public notice	146,372,392.67	13,170,078.07	8.9

RECEIPTS, BY STATES.

The table following gives a statement of additions to the reclamation fund from the sale of public lands, by States.

TABLE 9.—*Reclamation fund accretions from the sale of public lands.*

State.	Receipts from sales of public land, exclusive of town-site sales, transferred to credit of reclamation fund.	
	Fiscal year, 1919.	Total to June 30, 1919.
Arizona.....	\$107,010.94	\$1,640,260.16
California.....	214,291.58	6,596,553.87
Colorado.....	447,475.82	8,649,922.42
Idaho.....	232,007.92	6,148,367.43
Kansas.....	12,312.48	1,027,638.57
Montana.....	874,609.26	18,283,083.32
Nebraska.....	77,462.16	2,006,648.06
Nevada.....	44,540.98	735,868.14
New Mexico.....	255,594.47	4,969,752.98
North Dakota.....	34,391.71	12,185,912.05
Oklahoma.....	23,236.97	5,891,097.13
Oregon.....	193,414.51	11,165,112.62
South Dakota.....	103,241.91	7,476,817.25
Utah.....	308,143.83	2,646,092.78
Washington.....	84,460.78	7,106,147.45
Wyoming.....	601,160.09	5,897,300.33
Total.....	3,613,915.41	97,426,574.56

NOTE.—On June 30, 1919, there was in the Treasury the sum of \$229,286.35 accrued to the credit of the reclamation fund but not transferred, making a total of \$97,655,860.91, as per Table 10.

RECEIPTS, BY YEARS, FROM SALES OF PUBLIC LANDS.

During the fiscal year 1918 the General Land Office collected from the sales of public lands, not including town-site sales, a total of \$2,995,695.57, which resulted in the addition to the fund of \$2,552,650.65. During the fiscal year 1919 the gross receipts were \$2,449,371.08. Of this amount \$1,959,496.88 has been credited to the reclamation fund.

The following table shows the gross receipts from the sale of public lands and the corresponding accruals to the reclamation fund by fiscal years since the passage of the reclamation law:

TABLE 10.—Total receipts from the sale of public lands and resulting accruals to the reclamation fund.

Fiscal year.	Total receipts from sale of public lands in reclamation States (not including town-site sales).	Accruals to the reclamation fund.		Total receipts from sale of town lots in reclamation States.
		Amount (not including town-site sales).	Per cent of total receipts.	
1901.....	\$3,618,546.38	\$3,144,821.91	86.908	.....
1902.....	5,115,619.61	4,585,320.53	89.637	.....
1903.....	9,395,741.68	8,713,996.60	92.744	.....
1904.....	7,605,978.29	6,826,253.59	89.748	.....
1905.....	5,328,084.07	4,805,515.39	90.192	.....
1906.....	5,732,554.35	5,166,336.50	90.122	.....
1907.....	8,471,757.75	7,914,131.71	93.417	\$61,535.00
1908.....	10,235,294.28	9,430,573.98	92.137	12,864.06
1909.....	8,391,938.83	7,755,496.81	92.415	10,017.85
1910.....	7,679,421.61	7,028,185.73	91.521	60,112.86
1911.....	6,631,000.12	6,135,547.76	92.528	69,468.80
1912.....	6,324,012.34	5,657,498.88	89.460	15,224.10
1913.....	4,202,946.67	3,737,910.55	88.935	17,784.74
1914.....	4,058,991.61	3,460,451.63	85.229	15,280.25
1915.....	3,719,754.90	3,268,057.73	87.856	18,436.28
1916.....	3,186,239.81	2,648,057.74	83.109	21,189.28
1917.....	3,290,671.99	2,865,386.34	87.076	31,250.15
1918.....	2,905,695.57	2,552,650.65	86.113	60,990.56
1919.....	2,440,371.08	1,959,496.88	80.000	55,362.49
Total.....	108,433,620.94	97,655,860.91	90.006	449,516.42

NOTE.—This table differs from Table 9 in that it covers Land Office transactions in the various fiscal years, while Table 9 shows transfers to reclamation fund within the fiscal year, regardless of when collections were made by Land Office.

ALLOTMENTS AND GROSS COSTS, BY PROJECTS AND BY STATES.

This statement shows, by projects and by States, the amount of money allotted and the gross construction and operation and maintenance cost to June 30, 1919.

TABLE 11.—Statement of allotments and gross costs, by projects and by States, to June 30, 1919.

State and project.	Allotments.		Gross cost, construction, and operation and maintenance.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Arizona:				
Salt River.....		\$14,929,204.87		\$15,106,942.10
Yuma.....	\$395,495.00	8,913,142.73	\$327,258.59	8,362,544.56
Colorado River.....		36,279.30		36,279.30
Colorado River Basin.....	23,281.50	128,953.23	22,773.41	136,438.51
Little Colorado.....		9,554.33		9,554.33
San Carlos.....		24,829.51		24,829.51
San Pedro.....		2,427.34		2,427.34
Arizona cooperative.....		3,501.22		3,536.33
Preliminary investigation.....		39,578.78		39,578.78
Total.....	418,776.50	24,087,471.31	350,032.00	23,722,130.76
California:				
Yuma.....	81,005.00	1,825,583.45	67,028.87	1,712,810.33
Orland.....	63,650.00	1,174,364.26	59,140.52	1,125,810.58
Klamath.....	38,375.00	873,073.04	31,368.14	849,239.20
Colorado River.....		7,430.70		7,430.70
Colorado River Basin.....	4,768.50	26,412.11	4,664.44	27,945.24
Iron Canyon.....	10,000.00	19,185.96	3,325.05	22,058.88
Pitt River.....		2,500.00		2,499.18
Shasta County.....		2,500.00	152.62	2,297.37
Lassen County.....		5,000.00		1,945.60
Owens Valley.....		12,061.92		12,061.92
Sacramento Valley.....		43,620.72		43,620.72
San Joaquin.....		3,531.20		3,531.20
Imperial Valley.....		5,570.00		4,337.85
Kings River storage.....		768.60		1,157.70
San Luis Rey.....	700.00	700.00	706.41	706.41
Preliminary investigation.....		7,952.48		7,952.48
Total.....	198,498.50	4,010,234.44	166,386.05	3,825,405.36

TABLE 11.—Statement of allotments and gross costs, by projects and by States, to June 30, 1919—Continued.

State and project.	Allotments.		Gross cost, construction, and operation and maintenance.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Colorado:				
Grand Valley.....	\$323,000.00	\$3,876,332.24	\$267,712.13	\$3,545,157.26
Uncompahgre.....	184,700.00	7,644,087.71	178,863.94	7,341,651.64
White River.....		4,357.00		4,357.00
San Luis Valley.....	5,000.00	5,000.00	4,214.75	4,214.75
Preliminary investigation.....		3,718.75		3,718.75
Total.....	512,700.00	11,533,495.70	450,790.82	10,899,099.40
Idaho:				
Boise.....	545,000.00	14,696,009.70	566,942.04	13,186,498.33
King Hill.....	471,500.00	712,172.05	372,458.61	591,262.37
Minidoka.....	307,000.00	7,628,329.14	235,717.15	6,915,622.64
Dubois.....		17,228.91		17,252.06
Island Park.....		7,100.00	1,602.34	4,787.88
Port Neuf.....		2,168.01		2,168.01
Snake River Basin.....	20,000.00	20,000.00	24,775.82	24,775.82
Swan Valley.....		544.48		544.88
General investigation.....		4,000.00		1,191.78
Total.....	1,343,500.00	23,087,552.29	1,201,495.96	20,744,183.77
Kansas: Garden City.....		407,877.27		391,604.20
Montana:				
Huntley.....	89,600.00	2,347,305.58	89,241.97	2,094,651.60
Milk River.....	151,900.00	3,557,639.79	157,757.51	3,384,147.37
Milk River, St. Mary storage.....	101,500.00	2,846,833.21	122,376.92	2,571,327.30
Sun River.....	357,178.79	4,186,038.78	351,373.27	3,903,510.60
Lower Yellowstone.....	73,500.00	2,556,009.23	63,414.73	2,466,267.28
Clark Fork.....		6,581.23		6,581.23
Crow Reservation.....		18,911.96		18,911.96
Lake Basin.....		7,103.26		7,103.26
Madison River.....		10,729.09		10,729.09
Marias.....		13,459.01	15.15	13,538.60
Total.....	773,678.79	15,549,571.14	784,159.25	14,505,798.29
Nebraska:				
North Platte.....	713,492.97	8,650,496.70	822,173.91	8,155,004.57
Nebraska investigation.....		10,000.00		3,381.70
North Platte cooperative.....	2,450.00	2,870.00	2,420.80	2,883.85
South Platte.....		2,877.01		2,877.01
Total.....	715,942.97	8,666,243.71	823,594.71	8,164,147.13
Nevada:				
Newlands.....	308,000.00	7,326,266.48	258,819.82	7,016,144.82
Walker River.....		12,503.63		12,503.63
Walker River investigation.....		4,000.00		1,192.74
Total.....	308,000.00	7,342,870.11	258,819.82	7,029,841.19
New Mexico:				
Carlsbad.....	53,000.00	1,721,811.55	51,669.35	1,669,303.25
Hondo.....		407,742.36		381,573.39
Rio Grande.....	807,600.00	5,934,231.62	877,115.00	5,865,177.82
La Plata.....		28,064.23		28,064.23
Las Vegas.....		5,014.09		5,014.09
Upton Lake.....		17,464.70		17,464.70
Preliminary investigation.....		2,738.91		2,738.91
Total.....	860,600.00	8,117,067.56	928,784.95	7,969,336.49
North Dakota:				
North Dakota pumping.....	73,300.00	1,292,153.14	8,091.98	993,440.90
Lower Yellowstone.....	31,500.00	1,095,458.24	27,177.74	1,069,841.69
Bismarck.....		12,621.69		12,621.69
Little Missouri.....		11,933.52		11,933.52
Nesson.....		17,471.83		17,471.83
Washburn.....		10,531.53		10,532.78
Bowman.....		3,236.64	150.81	4,025.03
Preliminary investigation.....		4,961.03		4,961.03
Total.....	104,800.00	2,549,367.62	35,218.91	2,125,828.42

1 Deduct.

TABLE 11.—Statement of allotments and gross costs, by projects and by States, to June 30, 1919—Continued.

State and project.	Allotments.		Gross cost, construction, and operation and maintenance.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Oklahoma:				
Lawton.....	\$500.00	\$62,660.31	\$99.69	\$13,907.61
Cimarron.....		8,891.17		8,891.17
Red River.....		60,209.27		60,209.27
Turkey Creek.....		187.30		187.30
Investigation.....		400.00		400.00
Total.....	500.00	132,328.05	99.69	83,545.35
Oregon:				
Umatilla.....	113,000.00	2,994,888.70	184,291.36	2,860,301.77
Klamath.....	115,125.00	2,619,219.09	94,104.41	2,547,717.62
Central Oregon.....		40,346.41		40,346.41
Columbia River cooperative.....		20,012.47		17,008.51
Malheur.....		83,490.62		83,490.62
Oregon cooperative.....		53,261.49		49,994.83
Teal district.....		500.00		456.35
Owyhee.....	1,250.00	1,250.00	1,364.62	1,364.62
Preliminary investigation.....		943.79		943.79
Total.....	229,375.00	5,813,912.57	279,760.39	5,601,627.53
South Dakota:				
Angostura.....	400.00	7,500.00	414.56	6,874.31
Belle Fourche.....	92,855.00	4,143,410.61	82,928.85	4,033,068.96
Preliminary investigation.....		16,818.04		16,818.04
Total.....	93,255.00	4,167,728.65	83,343.41	4,056,761.31
Texas:				
Rio Grande.....	538,400.00	3,956,154.41	584,743.74	3,910,118.54
Pecos River investigation.....		8,500.00		7,113.37
Total.....	538,400.00	3,964,654.41	584,743.74	3,917,231.91
Utah:				
Strawberry Valley.....	85,000.00	4,182,564.46	68,600.43	3,609,215.44
Bear Lake.....		18,827.72		18,827.72
Mammoth Reservoir.....		500.00		404.27
Utah Lake.....		34,049.30		34,049.30
Provo-Weber.....		141.35		141.35
General investigation.....	6,500.00	9,450.00	6,308.49	9,039.28
Total.....	91,500.00	4,245,532.83	74,908.92	3,671,677.46
Washington:				
Okanogan.....	154,000.00	1,184,508.99	99,437.07	1,104,361.96
Yakima.....	640,500.00	13,245,135.02	706,670.35	12,001,102.53
Benton.....		11,105.05		11,167.45
Kittitas.....		19,408.50	141.60	19,366.90
Wapato.....		36,465.77		36,465.77
Palouse.....		76,409.01		76,409.01
Palouse cooperative.....		12,956.56		10,201.92
Priest Rapids.....		6,216.01		6,216.01
Preliminary investigation.....		3,776.96		3,776.96
Total.....	794,500.00	14,596,981.76	806,065.82	13,200,068.53
Wyoming:				
North Platte.....	305,782.70	3,707,355.73	351,931.67	3,495,001.96
Shoshone.....	607,664.67	6,759,406.44	634,496.44	6,422,663.83
De Bmet.....		8,917.88		8,917.38
Wyoming cooperative.....		808.15		3,681.76
Pathfinder pumping.....		2,380.00		1,554.96
Riverton.....		8,300.00		7,090.11
North Platte cooperative.....	1,050.00	1,230.00	1,037.49	1,235.71
Jackson Lake enlargement.....		850,937.64		788,153.37
Total.....	914,497.37	11,339,315.24	987,465.60	10,723,299.07
General accounts undistributed.....				45,687.03
General investigations.....	33,350.00	41,200.00	32,180.67	39,541.40
Total.....	33,350.00	41,200.00	32,180.67	85,228.42
Grand total.....	7,931,874.13	149,651,904.66	7,847,859.71	140,785,814.47

1 Deduct.

TABLE 12.—Appropriations by projects for the fiscal year 1919, showing increases, and decreases authorized, and amounts allotted from the appropriations for the fiscal year 1919.

Project.	Direct appropriations.	Ten per cent added.	Ten per cent deducted.	Balance appropriation for fiscal year 1918.	Special appropriations.	Collections and transfers.	Increase or compensation.	Totals available for allotment.	Amounts allotted.	Balances.
Salt River.....	\$797,000.00					\$195,108.12	\$19,968.56	\$797,000.00	\$476,500.00	\$797,000.00
Yuma.....	590,000.00					3,140.55	3,162.81	765,172.68	63,650.00	288,672.68
Orland.....	95,000.00					28,848.34	13,003.57	101,303.36	37,653.36	37,653.36
Grand Valley.....	348,000.00		\$21,000.00			174,278.02	10,938.89	368,851.91	323,000.00	45,851.91
Uncompahgre.....	185,000.00					62,004.03	24,988.24	370,216.91	184,700.00	185,516.91
Boise.....	732,000.00					7,680.30	15,921.16	818,063.27	545,000.00	273,063.27
King Hill.....	423,000.00	\$42,300.00				133,729.16	4,496.24	488,901.46	471,500.00	17,401.46
Minidoka.....	489,000.00		42,300.00		\$15,550.90	17,908.39	4,496.24	609,327.68	307,000.00	302,327.68
Minidoka.....	112,000.00					45,088.37	5,728.26	134,405.63	89,600.00	44,805.63
Huntley.....				\$6,512.09	1,076.61	12,671.91	4,185.40	271,220.78	151,900.00	17,820.78
Milk River.....	186,000.00			604.73	467.12	12,241.85	14,480.45	371,389.42	357,178.79	14,210.63
Milk River-St. Mary storage.....	322,000.00	22,200.00			52,000.00	21,790.53	3,388.19	132,178.72	105,000.00	27,178.72
Lower Yellowstone.....	55,000.00				21,275.67	30,162.68	39,104.22	1,092,762.80	1,019,275.67	73,487.13
North Platte.....	881,000.00	88,100.00		33,120.73		43,682.68	13,560.19	1,201,065.87	308,000.00	893,065.87
Newlands.....	671,000.00		67,100.00	539,943.00		17,846.02	3,462.08	96,306.10	53,000.00	43,306.10
Carlsbad.....	75,000.00					206,177.54	65,622.90	1,712,974.49	1,346,000.00	366,974.49
Rio Grande.....	286,000.00			146,174.05		61,149.65	2,556.49	1,127,706.14	73,300.00	54,406.14
North Dakota pumping.....	64,000.00							1,000.00	500.00	
Lawton.....	1,000.00							206,821.47	113,000.00	93,821.47
Umatilla.....	80,000.00			91,035.48		31,185.68	4,590.31	430,878.68	277,379.68	153,509.00
Klamath.....	423,000.00		22,200.00			24,614.03	6,415.65	274,338.82	92,855.00	181,483.82
Belle Fourche.....	262,000.00			52,515.42		7,770.31	4,568.51	154,224.93	85,000.00	69,224.93
Strawberry Valley.....	59,000.00					39,791.77	2,917.74	162,787.12	154,000.00	8,787.12
Okanogan.....	154,000.00					4,681.13	3,605.99	878,890.61	640,500.00	188,390.61
Yakima.....	645,000.00			25,066.94		126,408.90	32,414.87	883,303.57	607,664.67	275,638.90
Shoshone.....	400,000.00			92,983.18		55,219.74	12,955.98	141,934.53	10,000.00	
Shoshone.....	100,000.00				322,164.67	39,562.33	2,372.20		700.00	
Secondary.....										
Iron Canyon.....										
San Luis Rey.....										
Colorado River Basin.....										
San Luis Valley.....										
North Platte River cooperative.....										
Owyhee.....										
Angostura.....										
Utah reconnaissance.....										

RECONCILING ADMINISTRATIVE ACCOUNTS WITH TREASURY DEPARTMENT BALANCES AND STATEMENTS.

The accounts of the Treasury Department are limited to the movement of cash, either by withdrawal or deposit to the appropriations involved. The administrative accounts of the Reclamation Service, as entered in the table herein, show the amount, both for receipts and disbursements, upon an accrual basis. The cash account, however, must, if correct, agree with the Treasury Department statement of funds made available by appropriations, reimbursements, expenditures, and withdrawals. Table 13, below, shows a condensed statement of cash collected, appropriated, disbursed, and on hand, and Table 14 gives a reconciliation of the amounts of the appropriations, withdrawals, and balances used in the preparation of these financial tables, with the figures shown by the statements of the Treasury Department.

TABLE 13.—*Reclamation fund account to June 30, 1919.*

Item.	Debit.	Credit.
Total, end of fiscal year as per Seventeenth Annual Report, Table 12, p. 50.		\$94, 206, 813. 06
Receipts during fiscal year 1919:		
Appropriation warrant—		
No. 9, July 13, 1918.....	\$422, 105. 55	
No. 13, Aug. 28, 1918.....	385, 573. 45	
No. 19a, Sept. 30, 1918.....	18, 188. 97	
No. 20, Oct. 11, 1918.....	1, 076, 025. 88	
No. 25, Nov. 16, 1918.....	448, 984. 50	
No. 29, Dec. 31, 1918.....	19, 148. 60	
No. 32, Jan. 18, 1919.....	297, 928. 74	
No. 35, Feb. 17, 1919.....	148, 114. 96	
No. 37, Mar. 8, 1919.....	147, 126. 58	
No. 43, Mar. 31, 1919.....	11, 072. 83	
No. 46, Apr. 7, 1919.....	137, 324. 46	
No. 48, May 16, 1919.....	161, 863. 04	
No. 52, June 9, 1919.....	200, 732. 79	
No. 54, June 30, 1919.....	188, 135. 43	
Do.....	6, 952. 13	
Special reclamation fund, reimbursable, act of June 25, 1910 (36 Stat., 835).....		3, 669, 277. 90
Total.....		20, 000, 000. 00
Disbursements, 467,983 vouchers, as per Table 15.....	\$144, 820, 091. 31	117, 876, 060. 98
Collection vouchers, as per Table 16.....		28, 401, 691. 60
Balance with Treasurer United States, as per Table 14.....	460, 322. 91	
Balance with special fiscal agents.....	548, 179. 61	
Town-site collections credited to reclamation fund.....	449, 516. 42	
Erroneous settlement by Treasury Department.....		327. 67
Total.....	146, 278, 110. 25	146, 278, 110. 25

TABLE 14.—*Balance of reclamation fund with Treasurer of the United States, June 30, 1919.*

Item.	Appropriation.	Withdrawals.	Balance.
Total and balance, end of fiscal year 1918, as per Seventeenth Annual Report, Table 13, p. 50.....	\$114,206,813.08	\$113,290,722.75	\$926,090.33
Reclamation fund.....	3,669,277.90	4,175,273.68	1,505,965.78
Total and balance as per statement of Treasury Department.....	117,876,090.98	117,455,996.43	420,094.55
For items in Reclamation Service accounts, but not included in above, add withdrawals on direct settlement by auditor and advances.....	811,329.19		
Deduct repayments on direct settlements and repayment accounts.....	71,543.19		
		40,228.36	40,228.36
Total.....	117,876,090.98	117,415,778.07	460,322.91

¹ Deduct.

TABLE 15.—*Disbursement vouchers paid to June 30, 1919.*

Fiscal year.	Quarter ended—	Number of vouchers.	Amount.
Balance from Seventeenth Annual Report, Table 14, p. 50.....		439,392	\$136,616,578.87
1919.....	(Sept. 30, 1918)	7,510	2,243,252.98
	(Dec. 31, 1918)	7,292	2,101,811.68
	(Mar. 31, 1919)	7,099	2,007,089.83
	(June 30, 1919)	6,600	1,851,357.95
Subtotal for 1919.....		28,591	8,203,512.44
Total to June 30, 1919.....		467,983	144,820,091.31

TABLE 16.—*Collection vouchers to June 30, 1919.*

Fiscal year.	Quarter ended—	Number of vouchers.	Amount.
Balance from Seventeenth Annual Report, Table 15, p. 51.....		212,716	\$24,484,104.44
1919.....	(Sept. 30, 1918)	3,232	553,762.58
	(Dec. 31, 1918)	9,237	1,076,283.18
	(Mar. 31, 1919)	14,371	1,381,825.49
	(June 30, 1919)	11,098	905,715.91
Subtotal for 1919.....		37,938	3,917,587.16
Total to June 30, 1919.....		250,654	28,401,691.60

TABLE 17.—*Transfer vouchers approved to June 30, 1919.*

Fiscal year.	Quarter ended—	Number of vouchers.	Amount.
Balance from Seventeenth Annual Report, Table 16, p. 51.....		11,810	\$6,675,297.32
1919.....	(Sept. 30, 1918)	258	175,464.21
	(Dec. 31, 1918)	145	121,922.21
	(Mar. 31, 1919)	184	146,377.02
	(June 30, 1919)	172	151,745.96
Subtotal for 1919.....		759	595,509.40
Total to June 30, 1919.....		12,569	7,270,806.72

INVESTMENT OF THE UNITED STATES IN PROJECTS.

Below is given a statement showing cash disbursed and received on account of the several projects and transfers between projects. The work of the service is grouped under four general heads, as follows: Primary projects, those for which specific appropriations of funds are in effect and on which construction is under way; secondary projects, those for which general appropriations of funds have been made for all such work as a whole and on which only preliminary studies and surveys have been made to determine their advisability and practicability; Indian irrigation projects; and general accounts, which represent those expenditures that are general in nature and are not directly chargeable to any project when first incurred, but which become a charge against all projects as a part of the general or overhead expenses of the service.

Table 18 gives the voucher transactions and net investments of the United States on the several primary projects as of June 30, 1919; Table 19 gives the voucher transactions on secondary projects; and Table 20 gives the voucher transactions and net investment of the United States on Indian irrigation projects and miscellaneous as of June 30, 1919.

Table 22 shows the amount invested from the appropriation for increase in compensation for the fiscal year 1918 and 1919.

TABLE 18.—Voucher transactions and net investment of the United States on primary projects as of June 30, 1919.

State and project.	Debits.				Credits.			
	Disbursement vouchers.		Transfers received.		Collection vouchers.		Transfers issued.	
	Fiscal year 1916.	To June 30, 1919.	Fiscal year 1916.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Arizona: Salt River.....		\$14,238,082.28		\$491,235.74	\$298,415.95	\$4,530,005.84	\$87,284.04	\$10,132,028.12
Arizona-California: Yuma.....	\$419,361.37	10,108,586.15	\$23,466.48	641,666.20	206,040.68	1,278,466.40	108,693.22	9,045,817.73
California: Orland.....	53,763.41	1,075,453.62	5,936.48	62,100.82	55,168.95	236,017.18	691.26	875,269.34
Colorado: Grand Valley.....	249,689.48	3,442,568.90	16,489.52	174,005.75	28,447.45	101,472.75	22,238.94	3,462,860.96
Idaho: Urumchagre.....	165,771.83	7,262,866.79	11,137.24	208,930.23	171,799.12	902,147.68	38,666.61	6,589,655.78
Illinois: Rose.....	478,804.57	13,267,723.47	28,563.37	511,673.14	455,134.07	1,877,738.32	187,750.27	11,713,908.02
Kentucky: Kink Hill.....	377,913.20	6,576,888.30	32,212.19	52,872.08	6,551.29	10,731.63	7,098.11	402,472.60
Minnesota: Minnesota.....	240,806.43	6,734,788.21	19,404.14	38,612.92	454,769.74	2,259,807.10	15,068.77	4,616,024.98
Kansas: Garden City.....		380,261.22	12,862.83	12,862.83	4,085.32	47,664.57	11,928.26	334,128.26
Montana: Mandley.....	98,245.86	2,195,309.42	6,189.90	117,351.16	55,748.02	601,664.27	7,953.12	1,540,833.30
Nebraska: Milk River.....	150,718.43	3,256,428.96	11,108.90	179,872.12	43,467.91	116,792.11	1,050.05	3,260,669.28
St. Mary storage.....	96,449.06	2,445,897.46	5,638.19	236,802.85	12,508.20	77,094.04	976.50	2,548,535.07
Sun River.....	292,917.98	3,894,897.08	20,626.28	209,210.60	35,426.07	313,016.60	670.32	3,625,168.50
Montana-North Dakota: Lower Yellowstone.....	84,132.00	3,454,863.89	7,148.65	117,881.76	21,395.50	216,082.45	305.00	3,314,502.00
Nebraska-Wyoming: North Platte.....	1,478,600.41	11,381,638.21	85,863.32	456,227.60	419,842.37	1,783,133.32	3,404.75	10,060,306.20
Nevada: Newlands.....	273,528.17	6,827,970.08	22,935.86	345,068.44	138,391.97	946,673.83	3,560.90	6,197,606.04
New Mexico: Carlsbad.....	48,652.78	1,635,083.68	7,099.14	78,275.43	64,093.90	487,207.44	13,158.11	1,197,614.21
Hondo.....	1,532,974.36	8,787,811.16	9,122.25	14,960.97	107.83	34,749.50	2,167.34	8,787,811.16
New Mexico-Texas: Rio Grande.....					204,148.74	967,307.99		1,417,108.61
North Dakota: North Dakota pumping.....	65,968.98	1,164,457.84	5,092.01	207,944.40	48,617.59	217,605.81	12,532.06	854,577.41
Oklaoma: Lawton.....	94,067.61	2,827,334.94	18,241.37	115,491.81	85,006.02	554,099.70	2,742.92	2,827,334.94
Oregon: Umatilla.....	128,632.24	3,326,618.29	10,544.04	116,386.33	94,234.64	716,252.04	998.65	3,268,771.01
South Dakota: Klamath.....	76,197.92	3,977,708.93	5,837.23	116,011.46	160,511.25	780,121.29	35.00	3,265,694.06
Trask: Strawberry Valley.....	108,604.11	3,746,942.85	8,463.84	154,183.31	100,478.12	446,353.63	1,065.79	3,547,526.61
Washington: Dugan.....	116,298.39	1,059,820.70	19,828.54	63,781.55	6,306.61	198,506.07	22.07	913,641.70
Yakima.....	658,566.97	11,851,170.55	46,617.93	981,956.06	567,187.58	3,522,810.89	24,063.66	8,799,811.82
Wyoming: Shoshone.....	303,266.76	6,017,977.64	26,213.03	261,666.14	148,874.45	952,505.17	964.83	5,266,638.07
Total.....	7,602,424.65	135,286,520.36	535,813.86	6,468,144.88	3,814,720.18	24,240,400.80	113,843.19	115,184,125.33

1 Deduct.

TABLE NO. 19.—*Voucher transaction and net investment of the United States on secondary projects as of June 30, 1919.*

State and project.	Debits.			
	Disbursement vouchers.		Transfers received.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Arizona:				
Little Colorado.....		\$9,515.33		\$40.00
San Carlos.....		24,589.74		252.67
San Pedro.....		2,423.72		3.97
Arizona well irrigation.....	\$32.20	3,443.72		60.00
Arizona-California:				
Colorado River.....		42,235.20		7,160.35
Colorado River Basin.....	26,231.85	149,683.08	\$7,487.15	23,489.90
California:				
Owens Valley.....		26,048.91		30.00
Sacramento Valley.....		52,808.13		2,748.07
San Joaquin.....		3,513.92		17.48
Iron Canyon cooperative.....	1,467.18	16,667.23	776.07	4,977.62
Pit River cooperative.....		2,258.17		241.01
Shasta County cooperative.....	152.62	4,554.41		188.96
Lassen County cooperative.....		2,398.88		46.72
Imperial Valley.....		3,512.62		825.23
Kings River storage.....		768.60		398.10
San Luis Rey.....	691.52	691.52	14.89	14.89
Colorado: White River.....		4,348.04		9.11
Idaho:				
Dubois.....		21,464.03		858.13
Island Park.....	1,751.23	5,053.06	639.27	2,675.72
Port Neuf.....		2,165.77		2.24
General investigations.....		496.55	134.50	695.23
Swan Valley.....		544.48		40.40
Snake River Basin.....	8,063.75	8,063.75	15,881.66	15,881.66
Powder River.....	118.67	118.67		
Montana:				
Clark Fork.....		5,417.71		433.67
Crow Reservation.....		21,028.47		5.01
Lake Basin.....		7,044.39		79.87
Madison River.....		10,796.45		2.57
Marias.....		14,063.96		116.71
Nebraska:				
South Platte.....		1,913.96		963.05
Nebraska investigations.....		3,350.94		42.76
North Platte cooperative.....	3,594.76	3,866.96	171.72	174.32
Pathfinder pumping.....		1,554.96		
Nevada: Walker River.....		13,643.22		53.15
New Mexico:				
La Plata.....		29,598.20		168.55
Las Vegas.....		5,012.16		2.28
Urton Lake.....		19,330.65		273.71
San Luis Valley.....	3,531.06	3,531.06	327.91	327.91
North Dakota:				
Bismarck.....		16,709.04		26.66
Little Missouri.....		11,665.59		1,709.00
Nesson.....		7,491.51		29,786.35
Washburn.....		9,951.90		1,973.89
Bowman.....		3,654.96		1,512.97
Oklahoma:				
Cimarron.....		8,725.96		321.76
Red River.....		59,413.75		1,902.64
Oklahoma reconnaissance.....		400.00		
Turkey Creek.....		137.30		
Oregon:				
Malheur.....		82,592.87		4,312.28
Central Oregon.....		43,014.03		1,767.04
Columbia River cooperative.....		14,996.05		7,010.18
Oregon cooperative.....		46,797.43		11,691.10
Owyhee.....	966.36	966.36	250.00	250.00
Teel district.....				456.35
South Dakota: Angostura.....	396.68	6,522.41	32.13	684.02
Texas: Pecos River survey.....		7,498.21		871.29
Utah:				
Bear Lake.....		18,850.06		30.72
Mammoth Reservoir.....		184.60		219.67
Utah Lake.....		24,044.67		9.25
Provo-Weber.....		141.35		
General investigations.....		5,856.71	1,348.99	1,474.59

¹ Deduct.

TABLE NO. 19.— *Voucher transaction and net investment of the United States on secondary projects as of June 30, 1919—Continued.*

State and project.	Disbursement vouchers.		Transfers received.	
	Fiscal year.	To June 30,	Fiscal year.	To June 30,
	1919.	1919.	1919.	1919.
Washington:				
Benton.....		\$11,187.45		
Kittitas.....		19,408.50		
Wapato.....		36,445.06		\$20.71
Palouse.....		76,806.20		120.19
Palouse cooperative.....		9,394.00		3,164.48
Priest Rapids.....		6,218.98		247.58
Wyoming:				
De Smet.....		9,063.32		2.51
Wyoming cooperative.....		3,177.31		529.20
Riverton.....	\$9,263.78	15,211.09		1,077.10
General reconnaissance.....	35,949.02	41,071.37	\$5,640.51	6,812.15
Total.....	98,067.39	1,186,735.27	32,535.70	141,279.21

State and project.	Credits.		Transfers issued.		Net investment of the United States.	
	Fiscal year.	To June 30,	Fiscal year.	To June 30,	Fiscal year.	To June 30,
	1919.	1919.	1919.	1919.	1919.	1919.
Arizona:						
Little Colorado.....		\$1.00				\$9,554.23
San Carlos.....		12.90				24,829.51
San Pedro.....		.35				2,427.34
Arizona well drilling.....	\$466.70	1,912.71			\$434.50	1,591.01
Arizona-California:						
Colorado River.....		760.32	\$4,925.26			43,710.00
Colorado River Basin.....	534.28	1,063.92	\$2,852.45	5,959.79	\$0,332.27	166,178.27
California:						
Owens Valley.....		14,016.99				12,061.92
Sacramento Valley.....		91.79		11,843.09		43,620.72
San Joaquin.....		.20				3,531.20
Iron Canyon cooperative.....	5,681.32	15,477.39		540.96	\$3,438.07	5,626.50
Pit River cooperative.....						2,499.18
Shasta County cooperative.....		2,450.00			152.62	2,297.37
Lassen County cooperative.....		500.00				1,945.60
Imperial Valley.....	1,464.21	1,464.21			1,464.21	2,873.64
Kings River Storage.....						1,157.70
San Luis Rey.....					706.41	706.41
Colorado: White River.....		.15				4,357.00
Idaho:						
Dubois.....		1.81		5,068.29		17,252.06
Island Park.....	3.15	3.15	733.20	3,110.63	1,654.15	4,614.99
Fort Neuf.....						2,168.01
General investigations.....						1,191.78
Swan Valley.....						544.88
Snake River Basin.....	.15	.15			23,945.26	23,945.26
Powder River.....					118.67	118.67
Montana:						
Clark Fork.....		.25		269.90		5,581.23
Crow Reservation.....		1.90		2,120.62		18,911.96
Lake Basin.....				21.00		7,108.26
Madison River.....	3,630.44	7,218.55		67.08		10,729.09
Marías.....				632.20	\$3,630.44	6,329.92
Nebraska:						
South Platte.....						2,877.01
Nebraska investigations.....				12.00		3,351.70
North Platte cooperative.....			2.28	2.28	3,764.20	4,039.00
Pathfinder pumping.....						1,554.96
Nevada: Walker River.....						13,696.37
New Mexico:						
La Plata.....		1,702.42				28,064.33
Las Vegas.....		.30				5,014.09
Upton Lake.....		1,225.51		914.15		17,464.70
San Luis Valley.....			162.45	162.45	3,696.52	3,696.52

¹ Deduct.

TABLE NO. 19.— *Voucher transaction and net investment of the United States on secondary projects as of June 30, 1919—Continued.*

State and project.	Credits.				Net investment of the United States.	
	Collection vouchers.		Transfers issued.			
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
North Dakota:						
Bismarok.....		\$14.70		\$3,099.34		\$13,621.69
Little Missouri.....		1.25		1,439.82		11,932.52
Nesson.....		1.14		19,801.89		17,471.83
Washburn.....		42.38		1,350.68		10,532.73
Bowman.....	\$678.15	2,841.95	\$45.00	1,136.09	1 \$723.15	1,189.89
Oklahoma:						
Cimarron.....				156.55		8,891.17
Red River.....		161.77		945.35		60,209.27
Oklahoma reconnaissance.....						400.00
Turkey Creek.....						137.30
Oregon:						
Malheur.....		279.80		3,134.73		83,490.62
Central Oregon.....		1,353.58		3,061.08		40,346.41
Columbia River cooperative.....		218.12		4,779.60		17,008.51
Oregon cooperative.....	10,216.76	15,410.06	10,556.52	18,164.01	1 20,773.28	24,914.46
Owyhee.....					1,216.36	1,216.36
Teel district.....						456.35
South Dakota: Angostura.....	642.40	3,775.70		334.31	213.59	3,096.42
Texas: Pecos River survey.....	1,306.90	2,821.95		782.00	1,306.90	4,765.55
Utah:						
Bear Lake.....		62.06				18,827.72
Mammoth Reservoir.....						404.27
Utah Lake.....		4.62				34,049.30
Provo-Weber.....						141.35
General Investigations.....	999.45	999.45	30.07	30.07	6,176.08	7,936.40
Washington:						
Benton.....		156.00				11,011.45
Kittitas.....	1,458.67	2,273.65			1 1,458.67	17,134.85
Wapato.....						36,465.77
Palouse.....	2,330.09	4,128.52		400.00	1 2,330.09	72,406.87
Palouse cooperative.....		24.77		2,331.79		10,201.92
Priest Rapids.....		250.55				6,216.01
Wyoming:						
De Smet.....		39.55		98.90		8,917.38
Wyoming cooperative.....		24.75				3,681.76
Riverton.....	9,489.90	16,168.55		80.04	1 226.12	39.60
General reconnaissance.....	5,501.85	5,501.85	10,595.09	10,617.49	25,458.09	31,798.68
Total.....	44,404.42	104,437.54	24,977.06	107,414.04	61,221.61	1,066,162.90

¹ Deduct.

TABLE 20.—*Voucher transactions and net investment from the reclamation fund on Indian irrigation and miscellaneous as of June 30, 1919.*

Item.	Debits.					
	Disbursement vouchers.		Transfers received.			
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.		
Indian irrigation:						
Blackfeet project.....	\$72.87	\$926,221.94			\$109,379.18	
Flathead project.....	1,393.46	1,542,342.79			85,547.50	
Fort Peck project.....		440,664.24			40,897.01	
Total.....	1,466.33	2,909,228.97			235,823.69	
Miscellaneous:						
General expense.....	501,554.07	4,745,970.51	\$21,680.83	215,768.87		
Preliminary investigations.....				80,488.73		
Jackson Lake enlargement.....		741,636.20	5,478.99	109,301.34		
Total.....	501,554.07	5,487,606.71	27,159.82	405,558.94		

Item.	Credits.				Net investment.	
	Collection vouchers.		Transfers issued.			
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Indian irrigation:						
Blackfeet project.....	\$251.48	\$951,160.63		\$84,440.49	¹ \$178.61	
Flathead project.....	236.00	1,581,311.96		48,694.33	1,157.46	¹ \$16.00
Fort Peck project.....	126.51	466,372.65		16,188.60	¹ 126.51	
Total.....	613.99	2,997,845.24		147,223.42	862.34	¹ 16.00
Miscellaneous:						
General expense.....	57,218.99	215,159.83	\$455,169.08	4,653,171.90	10,846.83	93,407.65
Preliminary investigation.....						80,488.73
Jackson Lake enlargement.....	629.53	843,848.19	1,520.07	12,858.25	3,329.34	¹ 5,768.90
Total.....	57,848.57	1,069,008.02	456,689.15	4,666,030.15	14,176.17	168,122.48

¹ Deduct.

TABLE 21.—*Recapitulation of voucher transactions and all net investments of the United States from the reclamation fund as of June 30, 1919.*

Item.	Debits.			
	Disbursement vouchers.		Transfers received.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Primary projects.....	\$7,602,424.65	\$135,296,520.36	\$535,813.88	\$6,498,144.88
Secondary projects.....	98,067.39	1,136,735.27	32,685.70	141,279.21
Indian irrigation.....	1,466.33	2,909,228.97	.....	235,833.00
Miscellaneous.....	501,554.07	5,487,606.71	27,159.82	406,558.94
Total.....	8,203,512.44	144,820,091.31	595,509.40	7,270,806.72

Item.	Credits.			
	Collection vouchers.			
	Miscellaneous.		Water-right charges.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Primary projects.....	\$1,181,998.99	\$11,632,876.00	\$2,632,721.19	\$12,607,524.80
Secondary projects.....	44,404.42	104,437.54	.....	.....
Indian irrigation.....	613.99	2,997,845.24	.....	.....
Miscellaneous.....	57,848.57	1,069,008.02	.....	.....
Total.....	1,284,865.97	15,794,166.80	2,632,721.19	12,607,524.80

Item.	Credits.		Net investment.	
	Transfers issued.			
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Primary projects.....	\$113,843.19	\$2,350,139.11	\$4,209,675.16	\$115,184,125.00 ¹
Secondary projects.....	24,977.06	107,414.04	61,221.61	1,066,163.90
Indian irrigation.....	.....	147,223.42	¹ 852.24	¹ 16.00
Miscellaneous.....	456,689.15	4,666,030.15	14,176.17	168,127.48
Total.....	595,509.40	7,270,806.72	4,285,925.28	116,418,399.71

¹ Deduct.

TABLE 22.—*Investment, by projects, from the appropriation for increase of compensation to June 30, 1919.*

Project.	Debits.			
	Disbursement vouchers.		Transfers received.	
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Salt River.....		\$9,043.14		\$407.14
Yuma.....	\$19,981.95	39,145.12	\$1,087.05	1,758.70
Orland.....	2,908.39	4,870.89	254.42	350.49
Grand Valley.....	12,814.45	20,697.79	756.34	1,085.96
Uncompahgre.....	10,878.21	27,669.76	629.19	1,113.72
Boise.....	23,850.78	37,077.53	1,221.10	1,655.55
King Hill.....	15,234.94	20,114.34	786.44	963.50
Minidoka.....	12,570.39	19,890.83	777.23	1,117.54
Garden City.....				8.89
Huntley.....	4,696.84	9,447.98	275.36	476.38
Milk River.....	5,745.02	10,677.00	353.81	550.81
St. Mary storage.....	4,647.42	13,027.42	271.62	536.96
Sun River.....	15,113.25	24,866.86	748.61	1,063.41
Lower Yellowstone.....	3,198.85	4,484.77	248.47	340.64
North Platte.....	39,930.67	68,029.52	2,467.64	3,553.39
Newlands.....	12,641.58	21,318.36	918.61	1,302.03
Carlsbad.....	3,386.07	6,551.49	289.83	415.68
Rio Grande.....	64,980.69	97,940.81	3,183.86	4,220.59
North Dakota pumping.....	2,351.78	3,627.16	204.73	286.02
Umatilla.....	4,602.26	7,856.85	298.03	478.43
Klamath.....	6,520.52	11,024.94	415.86	634.84
Belle Fourche.....	4,283.38	7,939.18	285.13	422.83
Strawberry Valley.....	2,788.02	4,672.29	276.19	419.72
Okanogan.....	3,385.68	4,331.12	359.54	451.16
Yakima.....	34,044.09	98,471.97	1,787.36	3,814.59
Shoshone.....	12,514.70	28,339.78	693.43	1,905.15
Colorado Basin.....	789.81	980.84	60.48	75.48
Iron Canyon cooperative.....		10.93		
San Luis Valley.....	114.33	114.33	6.01	6.01
Island Park.....		67.98		9.91
Snake River Basin.....	356.85	356.85	280.51	280.51
Owyhee.....	24.16	24.16		
North Platte cooperative.....	58.39	58.39	4.07	4.07
Angostura.....		158.69		2.80
General investigations, Utah.....	100.08	108.84	1.54	1.54
Powder River.....	.53	.33		
Riverton.....	107.01	216.45	112.65	117.91
Blackfoot.....			106.54	148.43
Flathead.....			755.65	1,421.16
Fort Peck.....			108.96	191.13
Drainage and cut over.....			70.06	70.06
General accounts.....	20,635.15	31,247.15	3.68	3.68
General reconnaissance.....	909.91	1,081.96	111.16	111.16
Total.....	344,941.88	635,488.80	20,204.66	31,013.93

TABLE 22.—Investment, by projects, from the appropriation for increase of compensation to June 30, 1919—Continued.

Project.	Credits.				Net investment.	
	Collection vouchers.		Transfers issued.			
	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.	Fiscal year 1919.	To June 30, 1919.
Salt River.....						\$9,450.28
Yuma.....			\$0.93	\$0.93	\$21,068.07	40,902.89
Orland.....					3,162.81	5,221.58
Grand Valley.....		\$43.36			13,570.79	21,690.39
Uncompahgre.....	\$0.38	51.14			11,507.02	28,732.34
Boise.....	4.59	9.17			25,067.29	38,723.91
King Hill.....	1.39	7.81			16,019.99	21,060.03
Minidoka.....			10.00	18.66	13,337.62	20,989.81
Garden City.....						8.89
Huntley.....			6.00	6.00	4,956.20	9,918.36
Milk River.....		22.61			6,099.11	11,205.20
St. Mary storage.....		.40			4,919.04	13,563.98
Sun River.....	4.06	5.26			15,857.80	25,925.01
Lower Yellowstone.....		1.28			3,447.32	4,824.13
North Platte.....					42,398.31	71,582.91
Newlands.....	1.08	16.81			13,559.11	22,603.58
Carlsbad.....	.28	4.03			3,675.62	6,963.14
Rio Grande.....		10.08			68,144.55	102,151.32
North Dakota pumping.....		5.02			2,556.51	3,908.16
Umatilla.....					4,800.29	8,335.28
Klamath.....	.61	26.05			5,935.77	11,629.73
Belle Fourche.....	3.56	5.31			4,564.95	8,356.70
Strawberry Valley.....	4.67	4.67	1.00	1.00	3,052.54	5,086.34
Okanogan.....					3,745.22	4,782.28
Yakima.....	14.63	14.63			35,816.82	102,271.84
Shoshone.....			1.33	1.33	13,206.80	29,543.60
Colorado Basin.....					850.29	1,056.32
Iron Canyon cooperative.....					10.93	10.93
San Luis Valley.....					120.34	120.34
Island Park.....					.50	77.99
Snake River Basin.....					637.36	637.36
Owyhee.....					24.16	24.16
North Platte cooperative.....					62.46	62.46
Angostura.....						161.49
General investigations, Utah.....					101.62	105.38
Powder River.....					.33	.33
Riverton.....		1.50			219.66	332.86
Blackfeet.....					105.54	148.43
Flathead.....					755.65	1,421.16
Fort Peck.....					103.96	191.18
Drainage and cut over.....					70.06	70.06
General accounts.....	25.91	89.71	20,185.40	30,986.11	327.52	175.01
General reconnaissance.....					1,021.07	1,143.12
Total.....	61.16	318.84	20,204.66	31,013.93	344,890.72	635,169.96

COLLECTIONS.

The table below gives information as to collections that have been made under the reclamation operations.

TABLE 23.—*Analysis of cash collections to June 30, 1919.*

Sources.	Fiscal years 1903-1918.	Fiscal year 1919.	Total to June 30, 1919.
Miscellaneous sales.....	\$2,807,739.98	\$276,106.78	\$3,166,451.85
Miscellaneous services.....	1 4,846,891.95	322,096.23	5,168,978.18
Temporary water rentals.....	4,841,641.32	527,261.73	5,368,903.05
Power and light.....	1,727,111.13	143,099.95	1,870,181.08
Transportation refunds.....	358,196.98	11,871.06	370,067.99
Forfeitures by bidders and contractors.....	84,143.71	20.00	81,168.71
Water-right construction charges.....	1 6,000,047.78	1,478,050.03	7,492,606.42
Water-right operation and maintenance charges.....	1 3,776,859.80	1,154,671.16	4,834,417.26
Over disbursements.....	41,466.84	4,450.22	45,917.06
Total.....	24,424,104.44	3,917,587.16	28,401,691.60

¹ Inconsistency between this table and similar one in Seventeenth Annual Report caused by adjustment between classes of collections made in fiscal year 1919.

RIO GRANDE DAM APPROPRIATION.

The three tables that follow give for the Rio Grande Dam appropriation information similar to that appearing in Tables 15 to 17, inclusive, with corresponding titles for the reclamation fund:

TABLE 24.—*Special appropriation for Rio Grande (Elephant Butte) Dam (34 Stat., 1357) to June 30, 1919.*

	Debit.	Credit.
Appropriation warrant No. 79, Mar. 4, 1907.....		\$1,000,000.00
Disbursements, 2,896 vouchers.....	\$1,000,091.78	
Collections, 24 vouchers.....		91.78
Total.....	1,000,091.78	1,000,091.78

TABLE 25.—*Balances of appropriations for Rio Grande (Elephant Butte) Dam with Treasurer of the United States, June 30, 1907, to June 30, 1919.*

Fiscal year.	Appropriation.	Withdrawals.	Balances.
1907.....	\$1,000,000.00		\$1,000,000.00
1908.....		\$33,113.21	966,886.79
1909.....		137,074.22	829,812.57
1910.....		247,217.23	582,595.34
1911.....		327,875.96	254,719.38
1912.....		214,052.49	40,666.89
1913.....		39,166.89	1,501.00
1914.....		1,501.00	
Total.....	1,000,000.00	1,000,000.00	

TABLE 26.—*Disbursement and collection vouchers, appropriation for Rio Grande (Elephant Butte) Dam, paid and collected to June 30, 1919.*

	Disbursement vouchers.		Collection vouchers.	
	Number.	Amount.	Number.	Amount.
Balance from Seventeenth Annual Report.....	2,896	\$1,000,091.78	24	\$91.78

TABLE 27.—*Statement showing cost of investigations for the reclamation by drainage of lands outside existing reclamation projects and of the reclamation and preparation for cultivation of cut-over timber lands in any of the States of the United States (act of July 1, 1918, 40 Stat., 634-676).*

General and miscellaneous expense.....	1	\$26,570.84
Investigations in northern district.....		28,113.12
Investigations in southern district.....		39,168.06
Investigations in western district.....		6,862.78
Total.....		100,714.78
Add amounts collected, credited to cost, and carried to appropriation as refunds.....		284.36
Gross cost.....		100,999.14
Analyzed as follows:		
Direct appropriation.....	\$100,000.00	
Miscellaneous collections (refunds).....	284.36	
Increased compensation fund.....	723.47	
Total.....		101,007.83
Expenditures:		
Drainage and cut-over fund.....	\$96,447.16	
Increased compensation fund.....	723.47	
Subtotal.....		97,170.63
Balance unexpended June 30, 1919.....		3,837.20
Less liabilities on June 30, 1919.....		3,828.51
Balance of appropriation unencumbered.....		8.69

¹ Includes services of colonization expert, general studies, and office expense not practicable to allocate to districts.

TABLE 28.—Summary of financial and statistical results from operations of the United States Reclamation Service to June 30, 1919.

State and project.	Acres now susceptible to irrigation from completed works.	Gross construction cost to United States. ¹	Plus contribution work. ²	Plus operation and maintenance cost during construction.	Less cost adjustments and reverses.	Net construction cost.	Net operation and maintenance cost under public notice.
Arizona:							
Salt River.....	212,866	\$11,292,362.55	\$1,451,860.04	\$2,362,719.51	\$4,558,688.47	\$10,543,353.63	.....
Yuma.....	70,000	8,773,538.51	.....	723,040.30	399,763.53	9,065,804.19	\$462,780.05
California:							
Orland.....	20,533	940,640.97	.....	107,657.23	128,244.51	920,033.69	75,614.68
Colorado:							
Grand Valley.....	35,000	3,899,553.41	.....	145,038.85	55,175.96	3,489,981.30	.....
Uncompahgre.....	100,000	6,869,166.33	.....	973,466.31	767,137.39	6,574,514.25	.....
Idaho:							
Boise.....	274,020	11,649,195.24	29,812.50	1,079,268.13	794,830.70	11,973,276.17	388,694.75
King Hill.....	14,600	691,862.37	.....	330,353.90	193,819.42	5,865,043.68	827,690.60
Mindoka.....	121,392	5,456,852.54	211,626.66	52,863.30	10,180.71	381,626.49	.....
Kansas:							
Garden City.....	.....	338,736.00	.....	.....	.....	.....	.....
Montana:							
Huntley.....	31,860	1,750,942.62	.....	.....	13,077.85	1,737,864.77	335,180.26
Milk River.....	58,900	3,253,606.89	.....	120,541.48	76,960.05	3,307,157.32	.....
St. Mary storage.....	.....	2,528,353.09	.....	43,974.31	29,865.70	2,541,461.60	.....
Sun River.....	40,000	3,769,698.44	.....	16,467.48	46,021.01	3,729,074.91	177,968.13
Lower Yellowstone.....	42,151	2,915,090.43	.....	.....	21,691.68	2,893,498.75	552,187.11
Nebraska:							
Wyoming: North Platte.....	141,847	10,173,146.55	12,330.48	453,061.24	94,431.39	10,549,066.88	997,066.78
Nevada:							
Newlands.....	66,752	6,347,461.79	37,082.61	.....	14,402.67	6,370,141.73	617,355.30
New Mexico:							
Carlsbad.....	24,990	1,333,457.78	.....	.....	13,613.90	1,369,838.88	270,724.51
Hondo.....	.....	339,491.68	.....	43,081.71	9,706.08	371,867.31	.....
New Mexico-Texas: Rio Grande.....	107,000	9,267,996.13	.....	507,300.23	674,628.47	9,100,667.89	.....
North Dakota:							
North Dakota pumping.....	4,080	721,163.23	.....	.....	9,472.37	711,690.96	267,644.38
Oklahoma:							
Lawton.....	.....	13,907.61	.....	.....	9.75	13,997.86	.....
Oregon:							
Umatilla.....	24,653	2,364,827.46	78,364.00	.....	33,459.86	2,489,732.10	357,659.14
Klamath.....	50,000	3,019,536.57	6,705.07	65,866.88	60,760.33	3,031,341.19	296,716.24
South Dakota: Belle Fourche.....	82,892	3,479,801.66	.....	.....	16,634.69	3,463,266.97	548,914.01
Utah: Strawberry Valley.....	60,000	3,489,491.88	.....	12,511.90	26,294.63	3,479,706.15	94,538.17
Washington:							
Okanogan.....	10,100	942,292.37	.....	4,786.36	54,132.37	882,845.36	99,750.79
Yakima.....	132,130	10,609,074.48	8,140.88	15,800.92	217,801.06	10,415,215.17	1,302,184.14
Wyoming:							
Shoshone.....	56,100	6,068,261.21	.....	70,799.99	88,374.99	6,020,686.21	307,372.23

For footnotes see page 73.

TABLE 28.—Summary of financial and statistical results from operations of the United States Reclamation Service to June 30, 1919.—Continued.

State and project.	Funds from which project is being built (disbursements).					Amounts reimbursed to June 30, 1919 (collections). ^a						
	Reclamation. ^a	Bond loan. ^a	Increase of compensation. ^a	Special. ^a	Total investment. ^a	Construction. ^a	Operation and maintenance. ^a	Power and light. ^a	Water rentals. ^a	Miscellaneous. ^a	Totals. ^a	
Various:												
Secondary "....."												
General expense "....."												
Subtotals.....												
Jackson Lake enlargement "....."												
Indian projects "....."												
Total.....												
Arizona:												
Salt River.....	313,743,082.26	\$495,000	\$9,043.14		\$14,247,125.40	\$406,640.88	\$158,065.71	\$998,411.03	\$2,246,726.01	\$678,227.92	\$4,530,006.84	
Yuma.....	8,905,598.15	1,240,000	39,145.12		10,144,731.27	327,872.65	53,920.49		454,905.75	337,602.29	1,278,466.40	
California: Orland.....	1,075,453.62		4,870.86		1,080,324.51	63,041.06			119,600.22	19,455.41	236,017.18	
Colorado:												
Grand Valley.....	2,442,568.90	1,000,000	27,667.79		3,463,264.69				39,753.13	61,762.98	101,516.11	
Uncompahgre.....	5,762,859.79	1,500,000	27,669.76		7,290,529.55				741,166.38	161,032.44	902,198.82	
Idaho:												
Boise.....	11,287,723.47	2,000,000	37,077.53		13,304,801.00	435,823.05	164,161.01	82,794.56	671,427.10	523,541.77	1,877,747.49	
King Hill.....	576,888.30		20,114.34		600,002.64							
Minidoka.....	6,734,788.21		19,890.83		6,770,239.94	877,520.52	618,793.02	230,316.51	280,868.29	265,276.70	2,282,807.10	
Kansas: Garden City.....	380,291.22				389,563.08	142.50	104.50			46,888.50	47,085.50	
Montana:												
Huntley.....	2,195,309.42		9,447.98		2,204,757.40	305,792.14	198,435.21		2,404.11	100,034.81	801,664.27	
Milk River.....	2,256,428.96	1,000,000	10,677.00	1,028.61	3,268,132.57				46,576.76	77,238.96	119,815.72	
St. Mary storage.....	2,445,907.46		13,027.42	694.73	2,459,599.61					77,094.44	77,094.44	
Sun River.....	3,804,807.08		24,866.98	467.12	3,830,141.06	151,198.40	76,525.49		1,223.50	84,086.47	313,020.86	
Lower Yellowstone.....	3,454,863.89		4,464.77		3,459,348.66	41,700.97	36,968.00		83,806.01	53,470.76	216,082.73	
Nebraska-Wyoming: North Platte.....	9,381,638.21	2,000,000	68,029.52	21,275.67	11,470,943.40	869,941.55	735,634.33		35,570.62	151,986.82	1,768,133.23	

Nevada: Newlands.....	5,684,970.68	1,193,000	21,813.36	.....	6,849,289.04	376,010.46	349,865.45	74,465.91	8,989.90	150,658.92	988,600.64
New Mexico:											
Carisbad.....	1,635,093.68	.....	6,551.49	.....	1,641,615.17	214,679.89	230,767.23	.....	14,424.28	27,340.07	487,211.47
Hondo.....	382,784.16	.....	.....	.....	382,784.16	.....	.....	.....	9,037.50	25,712.00	34,749.50
New Mexico-Texas: Rio Grande pump-	4,287,811.16	4,500,000	97,940.81	1,000,091.78	9,886,843.75	.....	.....	.....	589,285.30	408,124.55	997,409.85
ing.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Dakota: North Dakota pump-	1,164,487.84	.....	3,627.16	.....	1,168,115.00	9,626.82	13,352.56	170,968.46	2,149.08	21,523.96	217,610.83
ing.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oklahoma: Lawton.....	12,334.84	.....	.....	.....	12,334.84	.....	.....	.....	.....	.....	.....
Oregon:											
Umatilla.....	3,502,604.11	325,000	7,866.85	.....	2,835,480.96	275,819.90	137,703.91	.....	21,328.66	119,247.28	554,099.76
Klamath.....	2,728,648.29	600,000	1,024.94	.....	3,337,673.23	378,037.33	237,067.42	3,020.00	38,372.75	89,790.59	716,278.09
South Dakota: Belle Fourche.....	3,977,708.93	.....	7,839.18	.....	3,985,648.11	324,505.01	328,680.66	.....	2,838.44	104,002.49	760,128.60
Utah: Strawberry Valley.....	1,476,942.85	2,272,000	4,672.29	.....	3,753,615.14	121,413.08	60,124.77	38,277.75	5,213.89	271,310.81	496,340.30
Washington:											
Okanogan.....	1,089,820.70	.....	4,331.12	.....	1,094,151.82	82,619.68	47,759.82	.....	102,178.00	14,188.86	198,508.07
Yakima.....	9,968,170.55	1,915,000	98,471.97	.....	11,976,642.52	1,866,140.27	1,163,461.75	1,764.71	73,060.73	412,897.44	3,822,823.52
Wyoming: Shoshone.....	6,017,977.64	.....	28,339.78	.....	6,368,482.09	412,002.46	228,387.92	3,635.33	5,743.63	306,371.16	962,505.17
Various:											
Secondary ".....	1,198,735.27	.....	3,124.75	.....	1,199,860.02	.....	.....	.....	.....	104,439.04	104,439.04
General expense ".....	4,745,970.51	.....	31,238.73	.....	4,777,209.24	.....	.....	.....	.....	215,249.54	215,249.54
Subtotals.....	127,149,229.14	29,000,000	935,489.38	1,370,483.24	149,175,159.86	7,492,006.62	4,834,417.26	1,603,634.26	5,516,499.99	5,115,290.66	24,560,408.79
Jackson Lake enlargement ".....	741,636.20	.....	8.42	.....	741,644.62	.....	.....	.....	.....	843,848.19	843,848.19
Indian projects ".....	2,909,228.97	.....	.....	51.38	2,909,280.35	.....	.....	.....	.....	2,997,845.24	2,997,845.24
Total.....	124,820,091.31	29,000,000	935,488.80	1,370,504.72	149,826,084.83	7,492,006.62	4,834,417.26	1,603,634.26	5,516,499.99	8,954,944.09	28,402,102.22

For footnotes see page 73.

TABLE 28.—Summary of financial and statistical results from operations of the United States Reclamation Service to June 30, 1919.—Continued.

State and project.	Net investment on June 30, 1919. ¹¹	Transfers. ¹²		Estimated value of land per acre.	Acres under cultivation.	Farmed by owners.	Farmed by tenants.
		Received.	Issued.				
Arizona:							
Salt River.....	\$10,141,478.40	\$491,642.88	\$97,284.04	\$225	206,616	121,313	84,303
Yuma.....	9,106,720.62	346,424.90	106,990.15	300-600	55,000	34,000	21,000
California: Orland.....	880,490.72	62,451.31	6,267.92	350	16,000	15,280	770
Colorado:							
Grand Valley.....	3,514,551.35	175,041.71	22,238.94	180	12,000	7,000	5,000
Uncompaggre.....	6,559,388.07	210,043.95	38,986.61	150	61,000	38,200	22,800
Idaho:							
Boise.....	11,752,631.93	613,328.09	187,750.37	300	265,440	178,808	76,632
King Hill.....	635,990.67	53,625.68	7,098.11	200-350	6,000	4,400	600
Minidoka.....	4,632,565.60	282,733.46	247,590.70	200	112,000	80,400	31,600
Kansas: Garden City.....	343,410.04	12,961.72	11,929.26	(*)	(*)	(*)	(*)
Montana:							
Huntley.....	1,550,751.66	117,827.54	170,166.01	180	20,000	12,000	8,000
Milk River.....	3,392,931.59	180,422.93	38,908.19	100	25,000	17,500	7,500
St. Mary storage.....	2,652,703.78	237,339.81	57,061.20	(*)	(*)	(*)	(*)
Sun River.....	3,649,660.63	210,374.01	77,833.58	150	27,698	23,133	4,515
Lower Yellowstone.....	3,319,326.13	118,222.40	42,191.20	100	35,000	27,400	7,600
Nebraska-Wyoming: North Platte.....	10,099,164.78	453,760.99	32,426.29	175	107,165	72,165	35,000
Nevada: Newlands.....	6,180,268.62	346,391.47	56,731.25	200	42,311	37,085	5,226
New Mexico:							
Carlsbad.....	1,204,677.35	78,691.11	28,517.46	125	20,484	12,290	8,194
Hondo.....	371,994.86	14,990.97	1,000.76	(*)	(*)	(*)	(*)
New Mexico-Texas: Rio Grande.....	9,295,964.75	510,867.60	133,336.75	260	75,000	62,000	23,000
North Dakota: North Dakota pumping.....	968,485.67	208,230.42	200,249.02	150	6,000	3,000	2,000
Oklahoma: Lawton.....	13,397.86	2,440.15	876.93	(*)	(*)	(*)	(*)
Oregon:							
Umatilla.....	2,296,174.96	115,970.24	101,156.49	250	11,000	8,250	2,750
Klamath.....	2,705,400.74	117,029.17	33,023.57	125	33,127	22,680	9,447
South Dakota: Belle Fourche.....	3,304,050.76	118,424.29	39,905.04	125	60,000	40,000	20,000
Utah: Strawberry Valley.....	3,352,612.95	154,603.03	59,264.92	75-150	59,000	53,100	5,900
Washington:							
Okanogan.....	918,423.98	64,232.71	11,454.48	750	6,500	5,900	600
Yakima.....	8,902,113.66	955,770.53	510,473.92	300	117,000	102,000	15,000
Wyoming: Shoshone.....	5,613,246.34	292,871.29	60,501.87	200	40,100	31,075	9,025
Various:							
Secondary ¹⁴	1,150,272.46	222,265.52	107,414.04				
General expense ¹⁵	93,574.24	215,772.55	4,684,153.01				
Subtotals.....	118,427,765.07	6,954,752.98	7,141,738.98				

Jackson Lake enlargement ¹⁴	11 5,780.48	100,801.84	12,808.26	.....	.....
Indian projects ¹⁷	1,978.02	287,766.53	147,222.42	.....	.....
Total	12 118,423,862.61	7,801,820.65	7,801,820.65	1,406,441	999,979
					406,462

¹ Includes supplemental construction, plant and clearing accounts.

² Value of works constructed by water users and turned over to the United States without cash consideration.

³ Disbursements from reclamation fund, act of June 17, 1902, and subsequent amendatory acts.

⁴ An advance to the reclamation fund, act of June 25, 1910.

⁵ Disbursements from Indeterminate appropriations to increase pay of employees during the war.

⁶ \$1,000,000 for Rio Grande Dam, act of Mar. 4, 1907. Other items in this column are payments from appropriations account of judgments through the Court of Claims.

⁷ Sum of four preceding columns.

⁸ Cash collected to date on account of construction, operation, and maintenance, power, and light, water rental, and miscellaneous.

⁹ Does not include credits on account of contributed work and discounts allowed. Includes advances, penalties, forfeitures, and refunds.

¹⁰ Sum of five preceding columns. Grand total includes \$28,401,691.60, reclamation fund; \$318.84, increased compensation; and \$91.78, Rio Grande Dam appropriation. See

Tables 22, 23, and 24. Transfer vouchers received and issued must be taken into considera-

tion in checking net investment by projects. This figure includes \$13,013.93, transfers affecting increased compensation fund not shown in Table 21,

¹¹ Deduct.

¹² Secondary projects include a large number of investigations in the arid States.

¹³ Cost of Washington and Denver offices is distributed monthly to various projects.

¹⁴ Work was performed for private companies, who deposited funds in advance. Final settlement has not been made. It is included in this statement because advances

were deposited to credit of reclamation fund and disbursed in the usual manner.

¹⁵ Item for Indian projects represents expenditures from reclamation fund and reimbursed by the Indian Bureau. Does not include work on Indian projects, expenditures

for which are made from funds appropriated directly for that work.

¹⁶ Greater than net investment shown on Table 21, annual report, for the reason that the latter represents "Reclamation fund" only, while Table 23 includes increased compen-

sation, Rio Grande Dam appropriation, and special appropriation on account of judgments by Court of Claims, etc.

¹⁷ Included in Milk River.

¹⁸ Not in operation.

ACCOUNTING TERMINOLOGY.

- Accounting.**—The art or science of analyzing, classifying, recording, summarizing, and interpreting facts relating to the acquisition, production, transfer, and ownership of articles of wealth or value.
- Accounts.**—Systematic statements of financial facts of identical or opposite character, so arranged as to readily provide summaries or balances of the same.
- Accruals of water-right charges.**—The installments on account of construction or operation and maintenance charges which become due upon definite dates.
- Advance payments of water-right charges.**—The amounts paid by water users in excess of accruals.
- Allotment.**—As used in the Reclamation Service, an allotment is that part of an appropriation which is allotted by the Director to a project for expenditure.
- Appropriation.**—As used in Reclamation Service accounting, this represents the amount of money set aside by Congress from the reclamation fund to be used in the construction or operation and maintenance, or both, of a project.
- Assets of a project.**—The amount of money, or property expressed in terms of money, which the projects owns or which is at its disposal.
- Bookkeeping.**—The mechanical operation of assembling financial data in books of record. (See *Accounts and Accounting*.)
- Capital investment.**—The group of accounts representing actual transactions in cash, or its equivalent. All money transactions and transactions in property and services expressed in terms of money, will be finally recorded in this group. The total "disbursements" less the total "collections" is the "net investment."
- Charges, water-right.**—See *Construction and Operation and maintenance charge*.
- Clearing accounts.**—Accounts for handling operating expenses incidental to the work, which can not be charged with reasonable accuracy direct to feature costs, and which are "cleared" in some more or less arbitrary manner at the close of stated periods.
- Collections.**—Moneys, or the equivalent thereof, received by the Government in liquidation of a debt due or to become due.
- Commercial paper.**—As used in reclamation accounting, commercial paper is synonymous with personal checks, bank drafts, post-office money orders, and like documents which are convertible directly into cash or its equivalent.
- Construction cost.**—See *Cost*.
- Construction water-right charge.**—A charge assessed against the irrigable area to cover the cost of construction of the irrigation system.
- Controlling accounts.**—Accounts established in the general ledger in which are summarized the transactions recorded and carried in subsidiary or auxiliary records.
- Cost.**—The gross cost of construction of a project is the value of services performed or property used, either directly or indirectly, in connection with the construction of the irrigation and auxiliary works of the project. It does not include the value of materials purchased and still in stock, but does include services and materials used, even though still unpaid and carried as liabilities. The net cost of construction of a project is its gross cost less the value of all revenues the occurrence or accrual of which is incidental to the work during the period of construction.
- Depreciation.**—The reduction of the original cost or value, due to deterioration by wear and tear or otherwise, of a structure, facility, or unit of equipment.
- Detail cost accounts.**—Classes or divisions of expense making up the cost of a physical feature.
- Disbursements.**—See *Expenditure*.
- Equipment.**—Equipment, or nonexpendable property, is property which neither loses its identity, becomes a permanent fixture, nor is immediately consumed when applied to its intended use.
- Estimate.**—As used in the Reclamation Service, an estimate is an opinion or calculation obtained from the best information at hand of the cost of doing a stated work and of the quantities of the several units of work contained therein.
- Expenditure.**—The payment or disbursement of cash, or its equivalent, when such act operates to deprive the payor of further use or control of the article or property

thus disbursed. In theory, when the construction of a project is completed, all liabilities and obligations liquidated, and all cash, equipment, materials, and other like assets expended in the work, then the "total expenditures" and the "gross construction cost" of the project will be equal.

Funds.—The amount of money available for expenditure for a specified purpose.

Gross costs.—See *Cost*.

Inventory.—An itemized account, catalogue, or schedule of equipment, materials, supplies, or other property which is on hand and available for use.

Investment.—See *Capital investment*.

Invoice.—The vendors' statement of goods sold, containing items, unit prices, and value of merchandise delivered or to be delivered. In reclamation accounting the term "invoice" must never be confused with "inventory."

Liabilities.—The amount of money, or of property or services expressed in terms of money, which the project owes, or is under obligation to pay, deliver, or render. (Repayment accounts are included in the project's liabilities for the reason that such accounts represent the amount of money which the project must return to the Government.)

Maintenance.—See *Operation and maintenance*.

Mercantile store.—The term used to designate buildings and contents where goods are kept for the purpose of sale, either for cash or coupons, or to be charged as deductions on pay rolls.

Mess house.—The term used to designate an eating place or dining room. It is improper to refer to such a place as a "commissary."

Nonexpendable property.—See *Equipment*.

Obligations.—See *Liabilities*.

Operation and maintenance.—"Operation" is the actual use of an irrigation system for the development and distribution of water, including works for drainage and flood protection, to preserve the irrigated lands against excess water. "Maintenance" embraces the repairs and renewals necessary to preserve the irrigation and drainage system in its original efficiency.

Operation and maintenance water-right charge.—An annual charge assessed against the irrigable area to cover the cost of the operation and maintenance of the irrigation system.

Operation and maintenance year.—The irrigation year, usually the calendar year (Jan. 1 to Dec. 31, inclusive). On some southern projects the operation and maintenance year is arranged to accord with the irrigation season, but unless otherwise specified the term "Operation and maintenance year" is synonymous with calendar year.

Original entry.—The first record made of a charge or credit which becomes the basis of proof of the account.

Physical features.—The division of principal features for the purpose of collecting special costs on separate and distinct jobs or units or divisions of a project. They usually represent some tangible product when construction is completed, such as a canal, dam, bridge, etc.

Physical inventory.—The act of determining the quantity of equipment, materials, or supplies on hand by actual counting, weighing, or measuring each kind of property, and of making definite record thereof.

Plant or plants accounts.—As used in reclamation accounting, these accounts are designed to receive all charges for the cost of original equipment and installation, with additions thereto, and also the cost of extraordinary repairs and of temporary plants erected to facilitate work on a project.

Posting.—The act of transferring amounts from a book or record of original entry to a ledger.

Principal features represent a general division of the project into primary parts or units, the nature or function of each feature is usually implied by its name, such as examination and survey, storage works, canal system, etc.

Property, nonexpendable.—See *Equipment*.

Refund.—A reimbursement of an amount previously paid.

Register.—As used in reclamation accounting, this is a journal which, by special ruling, is designed to facilitate the recording of accounting transactions. It is usually, but not always, a book of original entry.

Reimbursable accounts.—Those kept to record the results of operations not directly related to cost-ledger features; the cost of their maintenance is reimbursed by cash receipts or deductions from service earnings.

Repair.—Replacement of some part of a structure, facility, or unit of equipment, made necessary through wear or other casualty, when such replacement does not amount to a substantial change of identity in such structure, facility, or unit of equipment.

Repayments.—Represent the sources from which the Government expects to secure reimbursement to the reclamation fund.

Replacement.—The substitution, as a whole, for a structure, facility, or equipment, worn out or become inadequate in service, such substitution having no greater capacity than the thing for which it was substituted.

Resources.—See *Assets*.

Revenues.—Revenues are incidental to the construction or operation and maintenance of a project, and the accruals thereof tend to decrease the gross costs of the construction or operation and maintenance of the project as a whole.

Storehouses.—As distinguished from mercantile stores, storehouses are the buildings, bins, chutes, or yards in which Government property is stored, available for assignment to the work, or transfer to other storehouses or projects.

Supplemental construction.—The improvements of an irrigation or drainage system, or any part or structure thereof, of a completed project, or of a completed portion of a project, as to which the construction charges have been announced.

Water-right charges.—See *Construction and Operation and maintenance charge*.

DISCUSSION OF PROJECTS.

PRIMARY PROJECTS.

(For detailed tables on cement, unit bids and contract prices, engineering data for projects on completion, crops, etc., see appendix.)

ARIZONA, SALT RIVER PROJECT.

(Project turned over to water users on Nov. 1, 1917.)

W. R. ELLIOTT, Salt River Valley Water Users' Association, general superintendent and chief engineer, Phoenix, Ariz.

LOCATION.

Counties: Maricopa and Gila.

Townships: 2 S. to 3 N., Rs. 1 to 6 E. and 1 W., and Tps. 3 to 5 N., Rs. 11 to 14 E., Gila and Salt River base and meridian.

Railroads: Santa Fe, Prescott & Phoenix; Arizona Eastern.

Railroad stations and other towns, showing estimated population June 30, 1919: Phoenix, 30,330; Mesa, 4,500; Glendale, 1,500; Tempe, 2,000; Chandler, 1,400; Peoria, 350; Gilbert, 50; Scottsdale, 50; Higley, Lehi, Tolleson, Alhambra, Cashion, and Laveen, each about 25.

WATER SUPPLY.

Source of water supply: Salt and Verde Rivers and wells in various parts of the valley.

Area of drainage basins at Granite Reef Dam: Salt River, 6,250 square miles; Verde River, 6,000 square miles.

Annual run-off in acre-feet: Salt River at Roosevelt (5,760 square miles), 1889 to 1918, maximum 3,226,000, minimum 153,394, mean 846,260; Verde River at McDowell (6,000 square miles), 1889 to 1918, maximum 1,822,000, minimum 116,679, mean 570,860.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which works are prepared to supply water, season of 1918: 192,077 acres, entitled to permanent water, including private, homestead, and school lands, and townsites; and 20,889 acres entitled to temporary water service.

Area irrigated under rental contracts, season of 1918: 23,145 acres (on Sept. 30, 1918).

Area irrigated under public notice, season of 1918: 182,471 area (on Sept. 30, 1918).

Length of irrigating season: 365 days, October 1 to September 30.

Rainfall on irrigable area: 34-year period, average, approximately 8 inches. Calendar year 1918, 10 months, 10.4 inches.

Average elevation of irrigable area: 1,200 feet above sea level.

Range of temperature on irrigable area: 22° to 117° F.

Character of soil of irrigable area: Sandy loam, with clay in places.

Principal products: Alfalfa, grain, cotton, citrus, and deciduous fruits, and live stock.

Principal markets: Phoenix and other Arizona towns, Pacific coast cities, and eastern markets.

LANDS OPENED FOR IRRIGATION.

Public notices: January 18, May 19, August 8, 1917.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun: 1902.
 Construction recommended by the director: March 7, 1903.
 Construction conditionally authorized by the Secretary: March 14, 1903.
 Grand, Water Power, Salt River Valley, Maricopa, and Joint Head Canals purchased:
 June 15, 1906.
 Intake Dam for Power Canal completed: October, 1906.
 Power Canal completed: October, 1906.
 Irrigation by the Reclamation Service begun: May 15, 1907.
 Granite Reef Dam completed: August, 1908.
 South Canal completed: June, 1909.
 Eastern Canal completed: December, 1909.
 Roosevelt Dam completed: February 5, 1911; formal dedication, March 18, 1911.
 San Francisco pumping plant completed: October, 1911.
 South-Consolidated power plant, operation commenced: October 23, 1912.
 Arizona Falls power plant, operation commenced: May, 1913.
 Western Canal completed and operation commenced: February 16, 1913.
 Mesa District pumping plants (Batteries A, B, C, D, E, F), drilling commenced:
 December, 1908; final installation completed, June, 1913.
 Highline pumping plant put in operation: June, 1913.
 Highline Canal completed and operation commenced: June 16, 1913.
 Raising of spillways, Roosevelt Dam, completed: August, 1913.
 Joint Head Dam completed: March, 1914.
 Reconstruction of the Arizona Canal completed: February, 1915.
 McQueen pumping plant completed: March, 1915.
 Farm unit survey completed: April, 1915.
 Water over spillways of Roosevelt Reservoir: April 14, 1915; January-May, 1916.
 Survey for silt deposit in Roosevelt Reservoir: June, 1915.
 South Side Canal system completed: June, 1915.
 Installation of sixth unit, Roosevelt power plant, completed: November, 1915.
 Cross Cut power plant completed: December, 1915.
 Project turned over to water users: November 1, 1917.
 Project 100 per cent completed: June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Salt River project provides for the storage of water in the reservoir created by the building of the Roosevelt Dam, which is situated at the confluence of Tonto Creek and Salt River, about 70 miles northeast of Phoenix, Ariz. This stored water is carried down Salt River to a point about 4 miles below the mouth of the Verde River, where, together with such water as may be discharged by the Verde, it is diverted to the North and South side canal systems by the Granite Reef Diversion Dam. The water supply for the canals on the north side of the river is further augmented by the water diverted by the Joint Head Diversion Dam.

There have been completed and put into operation nine pumping plants with an approximate capacity each of 10 second-feet. A pumping plant located at the junction of the Western Canal and the Kyrene branch pumps water through a 54-inch pressure pipe 5,930 feet long to an elevation of 40 feet and waters approximately 7,500 acres of land. The United States claims all waste, seepage, unappropriated springs, and percolating water arising within the project, and proposes to use such water in connection therewith.

The canal and lateral system at present comprises 836.5 miles, and on completion of the project provides for the delivery of water to each 160-acre tract of irrigable land.

A power plant located at Roosevelt generates power from stored water in the reservoir and from water delivered from the Power Canal, heading at a diversion dam in Salt River, 19 miles above the storage dam. Three other power plants have been constructed by the water users' association and have become a part of the project, viz, the South-Consolidated, the Arizona Falls, and the Cross Cut. A portion of the power developed will be used for pumping water for irrigation and the remainder for industrial purposes.

The principal features are the Intake Dam and Power Canal, the Roosevelt Dam, Granite Reef Dam, Joint Head Dam, the main canals of the distributing system and the greater part of the lateral system, and the power system, comprising four power plants, transformer house, transmission lines, switching station, and four substations. Some work remains to be done on the sluicing tunnel through the Roosevelt Dam, and rather extensive repairs are now needed on the Intake Dam and Granite Reef Dam.

**SUMMARY OF GENERAL DATA FOR SALT RIVER PROJECT, TO END
OF FISCAL YEAR, 1919.**

Areas:	
Irrigable acreage when project is complete.....	192,077
Public land entered to end of fiscal year.....	16,170
Private land.....	175,907
Acreage Service could have supplied season of 1918.....	1 ¹ 212,966
Acreage actually irrigated, season of 1918.....	205,616
Acreage cropped under irrigation, season of 1918.....	184,432
<hr/>	
Crops:	
Value of irrigated crops, season of 1918.....	\$18,188,800.00
Value of irrigated crops, per acre cropped.....	\$98.70
<hr/>	
Finances:	
Net construction cost to end of fiscal year.....	\$10,548,253.63
Per cent complete at end of fiscal year.....	100
Appropriated for fiscal year 1920.....	\$1,000.00
Proposed appropriation, fiscal year 1921.....	\$1,000.00
Appropriation, fiscal year 1919.....	\$1,000.00
<hr/>	
Repayments:	
Value of construction water-right contracts.....	10,166,021.97
Construction charges—	
Accrued to end of fiscal year.....	406,640.88
Collected to end of fiscal year.....	406,640.88
2 Water-rental charges—	
Accrued to end of fiscal year.....	2,246,726.01
Collected to end of fiscal year.....	2,246,726.01
2 Power earnings—	
Accrued to end of fiscal year.....	998,411.03
Collected to end of fiscal year.....	998,411.03
<hr/>	
Drainage: Cost of drainage works to end of fiscal year.....	7,673.05

CONSTRUCTION DURING FISCAL YEAR.

North outlet tunnel.—Work was started in 1918 to control the discharge from the north outlet tunnel by constructing a new tunnel, tapping the present tunnel at a point immediately below the end of the pipes leading from the balanced valves and terminating on the south face of the north abutment cliff in which would be laid, imbedded in concrete, 3 steel pipes, on the discharge end of which will be installed 3 needle valves. It was intended that this work be completed during the winter months of 1918–19, but as the factory did not make shipment of the valves in time to complete the work it was necessary to postpone the installation into the winter of 1919–20. During the year ending June 30, 1919, the excavation of the tunnel was carried to breaking through into the old tunnel with approximately a 4-foot opening. All of the material and equipment required for the complete installation are on hand. The needle-valve installation is complete and about 30 feet of pipe have been laid in place. All the concrete has been placed in the needle-valve platform and needle-valve operating chamber. The installation is about 75 per cent complete.

Highline pumping plant.—As the present pumping plant supply of water to the Highline Canal system was found inadequate during the season of maximum irrigation, it was necessary to install a fourth

¹ Includes 20,889 acres entitled to temporary water service.

² All uncollected and unpaid items assumed by Salt River Water Users' Association when project was turned over under the provisions of contract dated Sept. 6, 1917.

unit at this plant. The original installation consisted of three 20-second-feet capacity pumping units, to which was added one unit with a pumping capacity of $33\frac{1}{3}$ second-feet driven by a 200-horsepower General Electric induction motor. This installation, in addition to the pump and motor, consists of a 20-foot extension to the original building and connection to the concrete pipe used to convey this water from the Western Canal to the Highline Canal. The total cost is \$11,667.60. To June 30, 1919, the plant with the additional unit has been found to be of sufficient capacity to meet the demands upon it for water.

Power plant No. 5.—A power development possibility located at the lower end of the Tempe Cross Cut Canal was acquired for the project during the early developing days and is now being improved by the installation of a hydro electric 600-kilowatt plant. The plant will operate under a 40-foot head and a normal water flow of about 200-second feet. The plant consists of a single generating unit made up of a S. Morgan Smith 860-horsepower turbine, direct connected to a 600-kilowatt, 2,200-volt, 3-phase, 25-cycle General Electric induction generator. The voltage as generated by this unit is stepped up by three 250 KVA transformers to 11,000 volts, which is the line voltage of the distributing system into which this plant feeds. The penstock connecting the forebay and turbine is a riveted steel pipe 66 inches inside diameter, approximately 98 feet long. A spillway is provided at the forebay of sufficient capacity to discharge the entire flow of the canal past the power plant at times when the plant is idle. This by-pass is an open concrete flume and delivers the water to the tailrace of the power plant. The plant is approximately 85 per cent complete and will be in operation during the coming fall.

Pumping plants.—During the early part of the year it was deemed advisable to augment the present supply of water by the installation of a number of pumping plants. After a thorough investigation was made it was decided to distribute the location of these pumping plants over the area or throughout the area where the underground water plane was nearest the surface of the earth. On the south side in the district south of Mesa, west of Gilbert, and north of Chandler, in the vicinity of the base line, there are to be installed about 20 plants, 6 of which are now installed. On the north side along the Salt River Valley Canal and along lateral 20 extending north to the vicinity of Peoria, together with four plants located north of the Grand Canal, immediately north of Phoenix, there will be installed about 22 plants, making a total installation of approximately 40 plants, of which, at the end of the fiscal year, 14 had been installed on the south side and 4 on the north side. The installation consists of a drilled 18-inch well averaging about 200 feet deep cased with 18-inch diameter No. 10 gauge steel well casing, an 18-inch multiple stage Layne & Bowler turbine casing pump, and one 35 horsepower Wagner vertical motor direct connected to the pump shaft; together with necessary switchboard equipment, low-voltage releases, transformers, lightning protection, and building. The average capacity of these wells is approximately 1,350 gallons per minute. This work is approximately 40 per cent complete.

Transmission lines for new pumping plants.—In order to supply electric power for pumping at the new wells it became necessary to

construct about 50 miles of 11,000-volt transmission line, 20 miles of which are on the south side portion of the project and 30 miles on the north side. The south side lines were completed and work started on the north side. Cedar poles were used, none of which was less than 40 feet in length. The new lines will, when completed, consist of about 8 miles of No. 2 copper line, 6 miles of No. 3 copper, 14 miles of No. 5 copper, and 21 miles of No. 6 copper. At each pumping plant is an outdoor substation consisting of a Burke type UB lightning arrester, a Kellman pole top automatic oil circuit breaker, and two 20 KVA Wagner transformers reducing the voltage to 440 volts for use at the motor.

SEEPAGE AND DRAINAGE.

During the past year a thorough investigation and study have been made on the underground water conditions. About 561 test wells are used to determine the water level. These have been measured at regular intervals throughout the season. No direct drainage work has been carried on, but the development of additional water by means of the pumping plants now being installed that are located in the area where the water plane is highest will, no doubt, make drainage on this project unnecessary.

OPERATION OF POWER SYSTEM.

The operation of the electrical system was carried on throughout the year with no unusual difficulties. The power generated on the system was reduced considerably below the production of the year previous, due, primarily, to the necessity of conserving the water supply for irrigation purposes. Practically no water was wasted from the reservoir for power development. As a result the output of the Roosevelt power plant during the winter months was very low, and this plant was shut down during a portion of the winter period. The load on the system at that time was carried by the valley power plants, assisted by power generated with steam at a local plant. The curtailment of copper production at the mines during the summer months resulted in a lowering of the output during the months of heavy irrigation. All of the 6 units in the Roosevelt power plant were in operative condition throughout the entire year, and there were available at this plant in generating capacity 10,000 KVA. Due to the level of the lake and consequent loss of hydraulic head this capacity was reduced to 8,350 KVA. The screen on the 10-foot penstock entrance was renewed. The 23,000-volt cables in the power house were overhauled and put in condition. New current transformer type roof bushings were installed on both Miami lines where they enter the transformer house.

The Cross Cut power plant operated nearly continuously throughout the year, and it was necessary to shut down only when water was out of the canal for cleaning purposes. Owing to the wearing effect the water had on the cast-iron shoes on the stream deflectors of the main units, it was necessary to renew the removable part of the shoe several times during the year. Considerable maintenance was necessary to keep the governors in proper working condition.

All of the generating units in this plant were painted. Vertical guide bearings on units No. 2 and No. 5 were rebabbitted.

The South Consolidated power plant operated continuously throughout the year, except when the water was turned out of the canal to make cleaning of the canal possible. All submerged steel in the power house and gates connected with the power house were overhauled and painted. Water was pumped from the tailrace and draft tubes and a thorough examination made of the foundations of the power house to determine if the water in the canal was in any way affecting the stability of the foundations of the building. It was found that the foundations were in perfect condition. This plant operated throughout the year with practically no trouble in the operation.

The Arizona Falls power plant operated at all times when water was in the Arizona Canal. During the time the water was out of the canal and the plant was idle the entire plant was thoroughly overhauled and all iron and steel work were given a thorough coat of paint. No trouble developed at this plant during the year.

The transmission lines were in continuous service during the year. The electrical storms occurring during the summer months were unusually severe, and considerable trouble from lightning was experienced on all lines. This resulted in nothing more than supply interruptions.

All the substations were in service throughout the year and no difficulty was encountered in their operation.

OPERATION AND MAINTENANCE.

The operation and maintenance of the irrigation system was carried on successfully throughout the year. The apparent water supply was less at the end of the fiscal year than at the same date a year ago, but was sufficient to meet requirements. Much assistance was obtained by introducing machinery in the maintenance of the main canal system. The Eastern Canal was cleaned and enlarged by removing 18 inches off each bank a distance of approximately 12 miles with a Ruth dredger, operated by two men. The rest of this canal is being enlarged with a drag-line excavator. A considerable saving in cost was effected by the use of the machinery, as well as permitting the cleaning to be carried on without shutting the water out of the system. This work can now be spread out through the entire year without losing the services of the canal under cleaning. The canal system has been extended by approximately 13½ miles of new laterals, making a total of 836.5 miles of canals and laterals.

The Roosevelt reservoir conditions for the year beginning October 1, 1917, and ending October 1, 1918, are summarized as follows:

	Elevation of water surface.	Contents.
	<i>Feet.</i>	<i>Acre-feet.</i>
Oct. 1, 1917 (highest point).....	201.1	958,379
Oct. 1, 1918 (lowest point).....	142.3	343,220
	58.7	649,450

Amount drawn during period, 804,521 acre-feet.

CROPS.

Crop report, Salt River project, Arizona, year ending Sept. 30, 1918.

(Data furnished by Salt River Valley Water Users' Association.)

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	63,037	Ton.....	220,631	3½	\$20.00	\$4,412,625	\$70.00
Barley.....	9,274	Hundred-weight.	166,941	18	2.75	459,087	49.50
Beans.....	550	Pound.....	660,000	1,200	.09	59,400	108.00
Berries.....	168					41,875	250.00
Cotton.....	50,107	Pound.....	47,601,400	1,950	.16½	7,854,233	156.75
Fruit, citrus.....	2,030	do.....	13,501,162	6,650	.04	540,046	266.00
Fruit, deciduous.....	2,130	do.....	21,302,500	10,000	.03	630,075	300.00
Garden.....	1,233					277,368	225.00
Lettuce.....	125	Crate.....	50,000	400	.85	47,500	380.00
Grain-sorghum.....	19,405	Pound.....	42,691,000	2,200	.03½	1,387,457	71.50
Grain-hay.....	1,594	Ton.....	2,390	1½	19.00	45,415	28.50
Indian corn.....	955	Pound.....	1,814,500	1,900	.03½	63,507	66.50
Watermelons.....	250	Hundred-weight.	25,000	100	2.00	50,000	200.00
Cantaloupes.....	2,200	Crate.....	440,000	200	1.25	550,000	250.00
Oats.....	1,174	Pound.....	1,973,160	1,680	.03	59,195	50.40
Pasture.....	44,002					880,040	20.00
Potatoes.....	727	Pound.....	3,971,000	5,500	.02½	99,275	137.50
Silage crops.....	291	Ton.....	2,910	10	5.00	14,550	50.00
Sudan grass (hay).....	2,002	do.....	12,012	6	16.00	192,192	96.00
Vineyard.....	136	Pound.....	570,150	4,200	.06	34,209	252.00
Wheat.....	6,650	Hundred-weight.	136,320	20½	3.60	490,751	74.00
Less duplicated areas.....	23,608						
Total cropped.....	184,432		Total and average.....			18,188,800	98.70
		Areas.	Acres.	Farms.	Per cent of project.		
Vacant land ¹	10,973	Total irrigable area farms reported.....	196,731	4,250	90		
Home tracts ²	5,326	Total irrigated area farms reported.....	184,432	4,250	84		
Town-site acreage.....	4,885	Irrigated under water-right applications.....	182,471	4,350	83		
		Irrigated under rental contracts.....	23,145	400	10½		
Total acreage receiving water.....	205,616	Total cropped area farms reported.....	184,432		84		

¹ Seed cotton.² Including roadways, ditches, and fallow land.³ Including house lots, corrals, etc.⁴ Estimated.

FINANCIAL STATEMENT.

Project balance sheet, June 30, 1919, Salt River project.

Construction contract water-right charges unaccrued.....		\$9,759,381.09
Gross construction cost.....	\$14,938,399.74	
Plus construction-cost adjustment.....	168,542.36	
	15,106,942.10	
Less construction-revenue earnings.....	\$3,580,277.44	
Less power earnings.....	998,411.03	
	4,558,688.47	
Net construction cost.....		10,548,253.63
Value of construction water-right contracts.....		10,166,021.97
Capital investment:		
Disbursement, transfer and joint construction vouchers received.....	\$16,190,628.32	
Collection, transfer, refund and joint construction vouchers issued.....	6,049,015.57	
Net investment.....		10,141,612.75

NOTE.—For detail financial statements, see Seventeenth Annual Report, pp. 71 to 73.

ARIZONA-CALIFORNIA, YUMA PROJECT.

W. W. SCHLECHT, project manager, Yuma, Ariz.

LOCATION.

Counties: Yuma, Ariz.; Imperial, Calif.
Townships: 3 to 13 S., Rs. 21 to 25 W., Gila and Salt River meridians; 9 to 17 S., Rs. 16 to 23 E., San Bernardino meridian.
Railroads: Southern Pacific; Yuma Valley Railroad.
Railroad stations and estimated population June 30, 1919: Yuma, 6,000; Gadsden, Ariz., 100; Potholes, Calif., 25.

WATER SUPPLY.

Source of water supply: Colorado River.
Area of drainage basin: 167,000 square miles above Laguna Dam.
Annual run-off in acre-feet of Colorado River at Yuma (225,000 square miles), 1902 to 1918: Maximum, 26,000,000; minimum, 7,960,200; mean, 16,900,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919, 70,000 acres.
Length of irrigating season: 365 days.
Elevation of irrigable area: 80 to 215 feet above sea level.
Rainfall on irrigable area: Six-year average, 2.55 inches; 1918, 2.9 inches.
Range of temperature on irrigable area: 22° to 118° F.
Character of soil of irrigable area: Bottom lands, rich alluvium; mesa lands, Fresno gravelly sand.
Principal products: Semitropical fruits, alfalfa, grain, and upland and Egyptian long-staple cotton.
Principal markets: Los Angeles and San Francisco, Calif.; Arizona towns; and eastern markets for early produce.

LANDS OPENED FOR IRRIGATION.

Dates of public notices: January 12, 1910; March 8, 1912; March 6, June 23, 1913; April 7, 1916; April 6, 1917; March 9, May 7, July 16, 1918; March 24, May 3, June 14, 1919.
Location of lands opened: T. 15 S., R. 23 E.; T. 16 S., Rs. 22 and 23 E.; San Bernardino meridian; T. 8 S., Rs. 23 and 24, W.; T. 9 S., Rs. 23 and 24 W.; T. 10 S., Rs. 24 and 25 W.; T. 11 S., Rs. 24 and 25 W., Gila and Salt River base and meridian.
Limit of area of farm units: Public, 40 acres.
Duty of water: 3½ acre-feet per acre per annum at the farm.
Building charge per acre of irrigable land: \$55, \$66, \$75, \$77, and \$90.
Annual operation and maintenance charge: \$2 per acre minimum charge, which entitles the water user to 2 acre-feet per acre of irrigable land, and \$1 per acre-foot for water in excess of this amount.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1902.
Construction recommended by board of engineers April 8, 1904.
Construction authorized by Secretary, May 10, 1904.
Canal system of Colorado Valley Pumping & Irrigating Co. purchased March 15, 1907.
First irrigation by Reclamation Service, season of 1907.
Canal system of Yuma Valley Union Land & Water Co. (Farmers' Gravity Canal) purchased February 3, 1908.
Rollins ditch (including Ives heading pumps and ditches) purchased July 23, 1908.
Laguna Dam completed March, 1909.
Colorado River siphon completed June 29, 1912.

Gravity water from Laguna Dam furnished to Yuma Valley through siphon June 29, 1912.

Yuma Valley Railroad constructed June, 1914.

Yuma Mesa auxiliary reclamation project act passed January 25, 1917.

Entire project 88.5 per cent completed June 30, 1919, exclusive of Yuma Mesa auxiliary project.

IRRIGATION PLAN.

The irrigation plan of the Yuma project provides for the diversion of water from the Colorado River at the Laguna Dam, 10 miles northeast of Yuma, Ariz., into a canal system heading on the California side, conveying water to the irrigable lands on that side of the river, including those in the Yuma Indian Reservation, crossing the river at Yuma through an inverted siphon and serving lands in the Yuma Valley below the town of Yuma. The plan also provides for large pumping plants below Yuma on the east main canal for raising water to irrigate 40,000 acres of mesa land. The lands adjacent to the Colorado River are protected from overflow by means of levees. The United States claims all waste, seepage, unappropriated spring and percolating water arising within the project and proposes to use such water in connection therewith. The Laguna Dam, 354.8 miles of canals and laterals, including 32 miles of drainage ditches, the Colorado River siphon, 930 feet in length and 14 feet in diameter, and the levee system are completed.

SUMMARY OF GENERAL DATA FOR YUMA PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	110,000
Public land entered to June 30, 1919.....	7,500
Public land withdrawn on June 30, 1919.....	37,500
State land unsold June 30, 1919.....	1,800
Indian land, June 30, 1919.....	8,500
Private land, June 30, 1919.....	54,700
Acreage service could have supplied in season of 1918.....	73,000
Estimated acreage service can supply in season of 1919.....	¹ 70,000
Estimated acreage service can supply in season of 1920.....	¹ 70,000
Acreage irrigated season of 1918.....	45,670
Acreage cropped under irrigation season of 1918.....	45,049

Crops:

Value of irrigated crops, season of 1918.....	\$5,105,132.00
Value of irrigated crops per acre cropped.....	113.82

Finances:

Net construction cost to June 30, 1919.....	\$9,095,806.19
Per cent completed on June 30, 1919.....	² 88.5
Appropriated for fiscal year 1920.....	\$383,000.00
Estimated per cent complete by June 30, 1920.....	² 89.5
Proposed appropriation for fiscal year 1921.....	\$435,000.00
Estimated per cent complete by June 30, 1921.....	91.0
Announced construction charges per acre, \$55, \$66, \$75, \$77, and \$90.	
Appropriation fiscal year 1919.....	\$590,000.00
Increase of compensation.....	19,066.56
Increase, miscellaneous collections.....	156,106.12
	\$765,172.68

Expenditures chargeable to 1919 appropriation:

Disbursements.....	371,906.72
Transfers.....	30,843.30
Current liabilities.....	43,466.46
Contingent liabilities.....	14,642.63
	460,859.11

Unencumbered balance on July 1, 1919.....	304,313.57
---	------------

¹Excluding North Gila Valley land.

²Exclusive of Yuma Mesa Auxiliary project.

Repayments:

Value of construction water-right contracts.....	\$1,941,721.78
Construction charges—	
Accrued to June 30, 1919.....	453,338.87
Collected to June 30, 1919.....	322,681.62
Uncollected on June 30, 1919.....	130,657.25
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	177,348.37
Collected to June 30, 1919.....	154,157.64
Uncollected on June 30, 1919.....	23,190.73
Water-rental charges—	
Accrued to June 30, 1919.....	455,426.03
Collected to June 30, 1919.....	454,905.75
Uncollected on June 30, 1919.....	520.28

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	6,000
Miles of drains built to June 30, 1919—	
Open.....	27
Closed.....	4
Total.....	31
Estimated acreage protected by drains to June 30, 1919.....	28,000
Estimated acreage to be protected by authorized system.....	58,000
Cost of drainage works to June 30, 1919.....	\$444,300.88

CONSTRUCTION DURING THE FISCAL YEAR.

Examination and survey.—Preliminary surveys, including test pits, estimates, and plans for an all-American canal from Laguna Dam to the Imperial Valley, were completed and the final report of the board of engineers is in progress. For the Yuma Mesa auxiliary project the preliminary surveys and estimates were completed and the draft of the public notice, including the farm unit plats for the first unit, was submitted.

Lateral system.—The work in progress on the lateral system consisted in building several small wooden turnouts, checks, and bridges for the farm units created by opening a portion of the Bard town site, and also for the farm units opened by the public notice of July 16, 1918.

Drainage system.—Work on the main drain for the Yuma Valley was in progress and 5.8 miles of this drain were built. The material moved amounted to 185,000 cubic yards. The building of the drain necessitated the reconstruction of 1.5 miles of laterals and the building of five flumes and four bridges. At the lower end of the drain work on the "boundary" drainage pumping plant was under way. The ultimate installation comprises a reinforced concrete building, one 75 and three 100 horsepower semi-Diesel engines, direct connected with one 30-inch and three 36-inch screw pumps; concrete forebay and reinforced concrete outlet through the levee. The plant, with the exception of the installation of two 36-inch pump units, was completed during November. The work on the plant involved 17,450 cubic yards of excavation and back fill, 1,315 cubic yards of reinforced concrete, the installation of 80 tons of machinery and ironwork, 9,700 linear feet of piling, and 70 square yards of paving. The cost of the plant is \$130,500.

Permanent improvements.—Two small cottages on the United States Reservation grounds at Yuma were built at a cost of \$2,160 each.

BOARD REPORTS.

Date.	Subject.	Personnel.
1918.		
July.....	Report to chief of construction on drainage for Yuma Valley.	D. W. Murphy, consulting engineer; W. W. Schlecht, engineer.
December...	Preliminary report to U. S. Reclamation Service and Imperial Irrigation District on All-American Canal to the Imperial Valley.	Elwood Mead, chairman; C. E. Grunsky; W. W. Schlecht, secretary; and Porter J. Preston, engineer.

OPERATION AND MAINTENANCE.

Water was delivered on a weekly rotation schedule during the heavy irrigation season and every two weeks during the winter months. The operation force consists of 2 water masters, 14 ditch riders, 2 pumpmen, 1 hydrographer, 1 clerk, and 4 gate tenders. The cost of maintenance is high on account of the silt and the rapid growth of weeds. The smaller laterals are cleaned by a large V machine, which is hauled by two 75-horsepower caterpillar tractors; for the larger laterals two $\frac{3}{4}$ -yard drag-line excavators are used. No important canal breaks occurred during the year. Water was delivered to the reservation unit, and to 12,500 acres of the Yuma Valley unit under water-right applications; the balance of the lands in the Yuma Valley received water under rental contracts in accordance with the stipulation issued by the court in which the Yuma suit is being tried. During 1918 the operation and maintenance charge was at the rate of 75 cents per acre-foot, which was increased to \$1 for 1919. The minimum charge is for 2 acre-feet. During 1918 a total of 150,229 acre-feet of water was delivered to irrigate 45,670 acres of land or 3.3 acre-feet per acre.

During July and August, 1918, and May and June, 1919, work on riprapping the levees was under way; 79,192 cubic yards of riprap were placed on the reservation (California) levee at the 5 and 8 mile points and 31,056 cubic yards on the Yuma Valley (Arizona) levee at the 17 and 21 mile points. In addition, 27,552 cubic yards of riprap and 26,165 cubic yards of earth were placed in raising the Yuma Valley levee from Yuma to the point opposite the temporary weir of the Imperial District at Hanlon Heading. The cost of this work was paid by the Imperial Irrigation District.

Historical review, Yuma project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Area for which service was prepared to supply water..	60,000	71,200	72,440	73,000	73,000	70,000
Acres irrigated.....	25,207	27,857	26,483	36,966	45,670	55,000
Miles of canals operated.....	272	307	316	335	338	355
Water diverted (acre-feet).....	154,670	246,786	249,700	337,597	314,900	350,000
Water delivered to land (acre-feet).....	93,167	92,897	94,393	136,541	150,229	181,000
Acre-feet to acre for area under cultivation.....	3.69	3.34	3.20	3.7	3.3	3.3

¹ Estimated.² Excluding North Gila Valley land.

SETTLEMENT.

The unentered public lands of the Yuma Valley were thrown open for settlement by the public notice of July 16, 1918. Eleven of the farm units were filed on by settlers of the Bard district whose units had been ruined by seepage and alkali. The balance of the units were allotted at a public drawing held at Yuma on December 11, 1918. A total of 684 applications were received for the 16 units. Due to the prevailing high price of cotton and alfalfa, the good crops, and the fact that over 80 per cent of the land was planted to these crops, the project is in excellent condition. Land values increased at least \$50 per acre.

Settlement data, Yuma project.

Item.	1914	1915	1916	1917	1918	To June 30, 1919.
Total number of farms on project (when completed).....	4,000	4,000	4,000	4,000	4,000	4,000
Number of farms reported.....	668	737	790	900	1,185	1,200
Population.....	1,815	2,036	2,002	2,700	4,300	4,500
Number of towns.....	3	4	5	5	5	5
Population.....	4,200	4,385	5,245	6,735	7,590	8,000
Total population of towns and farms.....	6,015	6,421	7,347	9,435	11,890	12,500
Number of public schools.....	14	15	17	20	20	20
Number of churches.....	7	7	9	9	10	11
Number of banks.....	3	4	4	4	4	5
Total capital stock of banks.....					\$175,000	\$205,000
Amount of deposits.....					\$1,321,468	\$1,923,287
Number of depositors.....					4,572	5,288

PRINCIPAL CROPS.

The principal crops raised during 1918 were cotton (64 per cent of area), alfalfa for seed, and hay (20 per cent of area), and corn (10 per cent of area). During 1919 the area in cotton was reduced and that in alfalfa increased.

Crop report, Yuma project, Arizona-California, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	8,929	Ton.....	28,695	3.21	\$19.70	\$565,322	\$63.31
Alfalfa seed.....	4,577	Pound.....	1,690,352	369.30	.23	380,216	83.06
Barley.....	425	Bushel.....	12,053	28.30	1.43	17,292	40.68
Corn sorghum.....	4,118	do.....	174,331	42.40	1.04	181,361	44.04
Hay, except alfalfa.....	593	Ton.....	975	1.60	13.57	13,234	22.32
Fruit.....	46	Acre.....				5,558	120.83
Cotton, Egyptian.....	2,915	Pound.....	710,763	244	.50	355,381	121.91
Cotton, short staple.....	25,693	do.....	10,143,762	395	.28	2,840,253	110.54
Corn fodder.....	216	Ton.....	549	2.5	10.04	5,515	25.53
Truck.....	180	Acre.....				13,956	87.23
Beans.....	28	Bushel.....	410	14.6	3.31	1,356	48.43
Pasture.....	2,342	Acre.....				44,848	19.18
Wheat.....	460	Bushel.....	9,343	20.3	1.90	18,664	40.57
Broom corn.....	42	Ton.....	15	.3	271.67	4,075	97.02
Cotton seed.....		do.....	10,597		58.00	614,626	
Total.....	50,544						
Estimated additional revenue derived from alfalfa and straw and pasturing stock lands.....						43,475	
Less duplicated areas.....	5,496						
Total cropped.....	45,049	Total and average.....				5,105,132	113.32
		Areas.	Acres.		Farms.	Per cent of project.	
Irrigated, no crop.....	621	Total irrigable area farms reported.....	57,850		1,185	52.6	
		Total irrigated area farms reported.....	45,670			41.5	
		Irrigated under water-right applications.....	20,980		542	19.0	
		Irrigated under rental contracts.....	24,690		643	22.4	
Total irrigated.....	45,670	Total cropped area farms reported.....	45,049			40.9	

PUBLIC NOTICES AND ORDERS.**PUBLIC NOTICE, JULY 16, 1918.**

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 368), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (36 Stat., 686), public notice for unentered public lands of the second unit of the Yuma project, Arizona-California, is hereby issued, as follows:

2. Lands for which water will be furnished.—Upon proper water-right application being made therefor, subject to the conditions hereinafter named, water will be furnished under said project for the irrigable unentered public lands of the second unit, excluded from operation of public notice of April 6, 1917, for said project, but shown on farm-unit plats of the following townships, viz:

Gila and Salt River base and meridian:

T. 8 S., R. 23 W.
T. 9 S., R. 23 W.
T. 8 S., R. 24 W.
T. 9 S., R. 24 W.
T. 10 S., R. 24 W.
T. 11 S., R. 24 W.
T. 10 S., R. 25 W.
T. 11 S., R. 25 W.

San Bernardino meridian:

T. 16 S., R. 21 E.
T. 16 S., R. 22 E.

as approved by the Secretary of the Interior on January 15, 1917, and amended on the date of this notice. Said plats as amended are on file in the office of the project manager, United States Reclamation Service, Yuma, Ariz., and in the local land office at Phoenix, Ariz.

3. Entry by contestants having preference rights.—During the statutory period of 30 days to be announced by notice of the local land office, homestead entry for the unentered public lands embraced in the farm units shown on said plats as amended, may be made at said local land office, by those contestants having preference rights to any such lands, if entry is found regular and is accompanied by the certificate of the project manager showing that water-right application has been filed and the proper water-right charges deposited.

4. Entry under the act of March 4, 1915.—On and from September 2, 1918, to November 30, 1918, inclusive, homestead entry for the then unentered public lands embraced in the farm units shown on said plats as amended, may be made at said local land office, but only by those entrymen of lands under the project entitled to make a lieu selection under the act of March 4, 1915 (38 Stat., 1215), if entry is found regular and is accompanied by the certificate of the project manager showing that water-right application has been filed and the proper water-right charges deposited.

5. General entry.—Homestead entries may be made at said local land office for all farm units shown on said plats as amended, not entered under paragraphs 3 and 4 of this notice, on and after 9 o'clock a. m., December 11, 1918, by persons holding approved water-right applications. Every person desiring to acquire any of said public land must execute a water-right application upon a form provided for that purpose and accompany the same by payment of the water-right charge as hereinafter provided. Each water-right application must be for a specified farm unit and more than one person may make such application for the same farm unit, but not more than one water-right application can be made by the same person. Such water-right application must be filed with project manager, United States Reclamation Service, Yuma, Ariz., in person, by mail, or otherwise within a period of five days beginning December 6, 1918, to and including 9 o'clock a. m., December 11, 1918. Water-right applications received after said period of five days will be filed and noted in the order of their receipt.

6. Simultaneous filing of water-right applications.—Water-right applications made and filed with the project manager during said five-day period will be held and treated as simultaneously filed and the project manager will dispose of them as follows:

(a) Where there is no conflict the water-right application will be approved by the project manager.

(b) Where there are two or more water-right applications for the same farm unit the project manager will write on cards the names of the several water-right applicants, and each of those cards containing the name of one such applicant, will be placed in an envelope upon which there is no distinctive or identifying mark, and at 2 o'clock p. m., December 11, 1918, after all the envelopes containing the names of the several water-right applicants shall have been thoroughly mixed in the presence of such persons as may desire to be present they will be drawn and numbered in order. The cards

as drawn and numbered will be securely fastened to the water-right applications of the respective persons, and the water-right applications will be approved in such order by the project manager.

7. **Approved water-right applications.**—Approval of a water-right application by the project manager will entitle the water-right applicant to file homestead application at said local land office, for the farm unit described in his water-right application. Such homestead application should be made within four days from date of approval of water-right application. Failure to so make such homestead application, will entitle the water-right applicant next in order for the same unit to have his water-right application approved by the project manager allowing him to make homestead application, this procedure continuing if necessary as to all applicants. No part of a payment made will be returned to a successful applicant in any case, if he be a qualified homestead entryman.

8. **Failure of applicant to obtain public land applied for.**—Where any applicant fails to obtain land applied for by him he will be permitted to elect whether he will amend his application to embrace other lands not affected by pending applications and otherwise subject thereto when such amended application is presented, or withdraw his original application without prejudice. In the event of such withdrawal the water-right charges deposited will be returned by the project manager upon surrender of the receipt therefor.

9. **Warning against unlawful settlement upon public land.**—No person will be permitted to gain or exercise any right whatever under any settlement or occupation of any of said public lands, begun without a valid approved water-right application covering the lands in question; provided, however, that this shall not affect any valid existing right obtained by settlement or entry while the land was subject thereto.

10. **Limit of area for which entry may be made.**—The limit of area per entry representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such lands, is fixed as shown upon the plats for the several farm units.

11. **Classes of charges for water right.**—The water-right charges are of two kinds, to wit: (a) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge, and (b) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

12. **Construction charge.**—The construction charge for said lands shall be \$75 per irrigable acre. An initial payment of 5 per cent of the construction charge shall be made at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual instalments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual instalments shall become due and payable December 1 of the fifth calendar year after the initial instalment, and subsequent instalments shall become due and payable on December 1 of each calendar year thereafter.

13. **Advance payment of construction charge permissible.**—Any water-right applicant or entryman may, if he so elects, pay the whole or any part of the construction charge owing by him within any shorter

period than that provided by the public notices and orders applicable to his land.

14. **Operation and maintenance charge.**—During the irrigation season of 1918, a charge of 75 cents per acre-foot will be made for water actually furnished the lands entered hereunder. The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice will be the same as that charged against other like lands under the project.

15. **Place and manner of payment of charges.**—All charges must be paid at the office of the United States Reclamation Service, Yuma, Ariz., in currency or by New York draft or money order payable to special fiscal agent, United States Reclamation Service.

16. **Exclusion of lands by action of Colorado River.**—Every water-right application shall contain the following provision:

The applicant hereby releases the United States from any and all claims for loss or damages on account of (1) the exclusion of said lands or any part thereof, from the irrigable lands of said project, or (2) the failure to supply water for the irrigation of any part of the lands hereinbefore described when such exclusion or failure is due to (a) the destruction, by flood, erosion, encroachment, or other action of the Colorado River, of the levees erected by the Reclamation Service along the banks of said river, or (d) a change in the location of said levees when such change is considered necessary by the proper officials of the United States to prevent the destruction of said levees from the said causes. Land so excluded shall be relieved from payment of all instalments of construction and of operation and maintenance charge which otherwise would thereafter come due from the lands so excluded.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, MARCH 24, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is made that the annual operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice, against all lands of the Yuma project, Arizona-California, under public notice, shall be a minimum charge of \$2 per irrigable acre whether water is used thereon or not, which charge will permit the delivery of not to exceed 2 acre-feet of water per acre; and that additional water will be furnished at the rate of \$1 per acre-foot. All operation and maintenance charges will be due and payable on March 1 of each year for the preceding irrigation season.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, MAY 3, 1919.

1. **Land for which water will be furnished.**—Upon proper application being made therefor, water will be furnished under the Yuma project, Arizona-California, in the irrigation season of 1919 and thereafter, for the irrigable lands of farm units L. & M., sec. 35, T. 10 S., R. 25 W., G. & S. R. B. M., shown on the diagram approved

by the reclamation service March 25, 1919, which diagram is amendatory of a farm unit plat approved by the department January 15, 1917. Said diagram and plat are on file in the office of the project manager, Yuma, Ariz., and at the local land office, Phoenix, Ariz.

2. Public notice of April 6, 1917, applicable.—All the terms and conditions of the public notice for the Yuma project dated April 6, 1917, so far as the same may be applicable, shall apply to the lands covered by this public notice and shown on the diagram above described.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, JUNE 14, 1919.

1. Land for which water will be furnished.—Upon proper application being made therefor, water will be furnished under the Yuma project, Arizona-California, in the irrigation season of 1919 and thereafter, for the irrigable lands of farm unit C, sec. 23, T. 10 S., R. 25 W., G. & S. R. B. M., shown on the diagram approved by the Reclamation Service, March 25, 1919, which diagram is amendatory of a farm unit plat approved by the department January 15, 1917. Said diagram and plat are on file in the office of the project manager, Yuma, Ariz., and at the local land office, Phoenix, Ariz.

2. Homestead entry.—Homestead entry of said farm unit C may be made on or after the date of this notice, under the act of August 17, 1916 (39 Stat., 516), at said local land office, if found regular and accompanied by the certificate of the project manager, showing that water-right application has been filed and the proper water-right charges deposited.

3. Public notice of April 6, 1917, applicable.—All of the terms and conditions of the public notice for the Yuma project dated April 6, 1917, so far as the same may be applicable, shall apply to the lands covered by this public notice.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet Yuma project, June 30, 1919.

Cash		\$1,657.05
Inventory of materials and supplies on hand		78,231.64
Accounts receivable:		
Current accounts due	\$164,667.63	
Construction water-right charges unaccrued	1,488,382.91	
		1,653,050.54
Construction work contracted: Undelivered orders		9,642.63
Gross construction cost	9,495,569.71	
Less construction revenue earnings	399,763.52	
		9,095,806.19
Net construction cost		
Gross operation and maintenance cost	579,785.18	
Less operation and maintenance earnings	117,055.13	
		462,730.05
Accounts payable		52,564.35
Contingent obligations		11,299.68
Collections and contracts of specific amounts for repayments to reclamation fund		2,130,533.45
Capital investment:		
Disbursement, transfer, and joint construction vouchers received	10,491,156.17	
Collection, transfer, refund, and joint construction vouchers issued	1,384,435.55	
		9,106,720.62
Net investment		

Feature costs of Yuma project, June 30, 1919.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
General.....	\$2,294.49	\$178,282.38
Yuma Mesa auxiliary.....	878.52	19,407.08
All-American canal.....	16,777.36	12,206.78
	19,950.37	209,896.24
Canal system:		
Preliminary work.....		167,514.46
Laguna Dam in Colorado River.....		1,749,811.04
Headworks at Laguna dam.....		352,334.25
Main canal.....	162.35	542,941.41
Siphon under Colorado River at Yuma.....		694,703.22
Other structures on main canal.....		65,422.53
	162.35	3,572,726.91
Lateral system:		
Yuma Valley.....	1,998.29	990,318.57
Indian reservation.....	2,261.02	367,558.48
Gila Valley.....		153,439.78
	4,229.31	1,511,366.83
Drainage system:		
Yuma Valley.....	49,081.40	167,622.16
Yuma Valley pumping plant.....	24,348.07	130,529.27
Indian reservation.....		146,149.45
	73,429.47	444,300.88
Flood protection:		
Yuma Valley.....	8,082.62	1,378,515.05
Indian reservation.....	19,855.47	867,287.12
Gila Valley.....		405,363.97
	\$27,938.09	2,651,166.14
Farm units.....		32,514.60
Permanent improvements and land.....	5,499.89	179,598.56
Telephone system.....		12,468.11
Operation and maintenance during construction.....	\$273.17	722,040.20
Gross cost of construction features.....	130,936.31	9,336,078.47
Balance in plant accounts.....		159,452.92
Balance in unadjusted clearing accounts.....		38.32
Gross cost to June 30, 1919.....	130,936.31	9,495,569.71
Less revenue earned during construction:		
Rental of buildings.....	\$392.22	6,383.24
Rental of grazing and farming lands.....	\$30.00	1,340.50
Rental of irrigation water.....	4.23	346,515.38
Contractors' freight refunds.....		18,505.86
Other revenues, unclassified.....		23,366.27
Loss on hospital operations.....	\$92.65	\$247.94
Gain on railroad operations.....	4,533.85	3,900.21
	4,023.21	399,763.52
Net construction cost, June 30, 1919.....	126,913.10	9,095,806.19
Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Surveys, general:		
Gross cost.....	\$2,915.49	\$178,903.38
Reimbursements.....	621.00	621.00
Net cost, as shown.....	2,294.49	178,282.38
Surveys, All-American canal:		
Gross cost.....	26,777.36	37,206.78
Reimbursements.....	10,000.00	25,000.00
Net cost as shown.....	16,777.36	12,206.78
Costs not included under flood protection, because reimbursed in full:		
Yuma city levee improvement.....	12,666.20	12,666.20
Yuma Valley levee improvement.....	34,145.46	55,336.37
Surveys at Hanlons heading.....	250.20	250.20
	47,061.86	68,252.77
Reimbursements.....	47,061.86	68,252.77
Deduct.		

Cost statement, by calendar years, Yuma project.

Year ending Dec. 31—	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1907.....	\$1,552,917.35	\$8,531.91	.....	\$8,531.91	\$1,568,449.26
1908.....	1,151,270.00	31,976.49	.....	31,976.49	1,183,246.49
1909.....	772,675.05	52,776.24	.....	52,776.24	825,451.29
1910.....	408,686.34	77,866.11	\$17,607.12	95,473.23	504,189.57
1911.....	913,555.20	81,346.35	42,439.91	123,786.26	1,037,341.46
1912.....	1,295,435.08	80,584.55	20,225.72	100,810.27	1,396,245.35
1913.....	307,131.30	54,408.32	16,305.40	70,713.72	377,845.02
1914.....	400,027.80	59,641.00	20,974.20	80,615.20	549,643.00
1915.....	695,992.32	78,566.70	32,233.85	110,800.55	806,822.87
1916.....	387,435.92	88,056.69	59,519.66	147,576.35	535,012.27
1917.....	333,052.15	108,529.01	28,024.86	136,553.87	469,606.02
1918.....	294,406.90	.....	188,270.64	188,270.64	482,677.54
Jan. 1 to June 30, 1919.....	34,437.86	\$ 273.17	145,183.82	144,910.65	179,348.51
Subtotal.....	8,614,088.27	722,040.20	579,785.18	1,301,825.38	9,915,863.65
Plant accounts June 30, 1919.....	159,452.92	.....	.....	.....	159,452.92
Unadjusted clearing accounts June 30, 1919.....	38.32	.....	.....	.....	38.32
Total.....	8,773,529.51	722,040.20	579,785.18	1,301,825.38	10,075,354.89

¹ Includes prior years.² Credit.*Cost statement, by fiscal years, Yuma project.*

Year ending June 30—	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1908.....	\$2,072,001.51	.....	.....	.....	\$2,062,001.51
1909.....	1,154,114.78	.....	.....	.....	1,154,114.78
1910.....	491,356.42	.....	.....	.....	491,356.42
1911.....	596,830.96	.....	.....	.....	596,830.96
1912.....	1,575,164.44	.....	.....	.....	1,575,164.44
1913.....	465,201.95	.....	.....	.....	465,201.95
1914.....	287,424.01	\$419,182.61	.....	\$419,182.61	706,606.62
1915.....	804,776.88	70,036.90	\$141,480.56	211,517.46	1,016,294.34
1916.....	433,062.14	83,015.25	54,859.59	137,874.84	571,506.98
1917.....	305,640.79	92,117.86	34,935.65	127,053.51	432,694.30
1918.....	299,624.91	57,960.75	85,158.23	143,118.98	439,743.89
1919.....	131,209.48	\$ 273.17	263,351.15	263,077.98	394,287.46
Subtotal.....	8,614,088.27	722,040.20	579,785.18	1,301,825.38	9,915,863.65
Plant accounts June 30, 1919.....	159,452.92	.....	.....	.....	159,452.92
Unadjusted clearing accounts June 30, 1919.....	38.32	.....	.....	.....	38.32
Total.....	8,773,529.51	722,040.20	579,785.18	1,301,825.38	10,075,354.89

¹ Includes prior years.² Includes years 1907 to 1914.³ Credit.

Estimated cost of contemplated works, Yuma project, during fiscal year 1920.

Features.	Subfeature.	Principal feature.
Examination and survey:		
Hydrographic data and silt investigations, Colorado River	\$1,500	
Completion of investigations and final report All-American Canal to Imperial Valley	3,000	
Investigation Yuma Mesa auxiliary project	1,500	
Lateral system—Extension of lateral system to marginal lands	3,000	\$6,000
Drainage system—Open drains	25,000	3,000
Irrigable lands (farm units)—Surveying and plotting marginal lands	200	25,000
Permanent improvements—Three headquarters stations for ditch riders	2,400	200
Operation and maintenance (public notice):		
Bard and Indian units (15,000 acres)	30,000	
Yuma Valley unit (50,000 acres)	90,000	
Maintenance of levees (38 miles)	100,000	
Reimbursable accounts—Working fund for mess houses, hospitals, and railroad operations	2,000	220,000
Total		258,600

Operating costs and revenues, Yuma project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Canal system:						
Laguna Dam and head-works	\$4,297.40	\$779.07	\$5,076.47	\$11,706.20	\$41,268.38	\$52,974.58
Main canal	3,726.39	483.32	4,209.71	4,749.15	1,250.13	5,999.28
	8,023.79	1,262.39	9,286.18	16,455.35	42,518.51	58,973.86
Lateral system:						
Bard unit	4,203.96	4,081.82	8,285.78	51,991.96	89,770.47	141,762.43
Indian unit	4,227.72	7,687.20	11,914.92	16,181.68	37,263.17	53,444.85
Yuma Valley unit	27,208.51	61,508.94	88,717.45	27,208.51	61,508.94	88,717.45
	35,640.19	73,277.96	108,918.15	95,382.15	188,542.58	283,924.73
Drainage system:						
Indian reservation drainage	822.64		822.64	9,533.37	12,925.73	22,459.10
Yuma Valley drainage	3,454.36		3,454.36	3,454.36		3,454.36
	4,277.00		4,277.00	12,987.73	12,925.73	25,913.46
Flood protection:						
Indian reservation levee		39,520.66	39,520.66		39,520.66	39,520.66
Yuma Valley levee		26,268.65	26,268.65		26,268.65	26,268.65
		65,789.31	65,789.31		65,789.31	65,789.31
Total	47,940.98	140,329.66	188,270.64	124,825.23	309,776.13	434,601.36
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants			59,478.35			177,348.37
Operation and maintenance charges paid and forfeited by water-right applicants			2,211.33			2,877.33
Penalties on operation and maintenance charges accrued on contracts with water-right applicants			986.59			1,626.81
Rentals of buildings during operating period			1,131.84			5,800.58
Rentals of irrigation water			56,616.39			56,616.39
Other revenues unclassified, earned during operating period			1,239.76			1,261.76
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants (contra)			1,260.08			1,480.98
Total			121,404.18			245,050.26
Difference (deficit)			66,866.46			189,551.10

¹ Deduct.

CALIFORNIA, ORLAND PROJECT.

A. N. BURCH, project manager, Orland, Calif.

LOCATION.

Counties: Glenn and Tehama; reservoir and storage feed canal in Colusa County.

Townships: 21 to 23 N., Rs. 2 to 4 W., Mount Diablo meridian.

Railroads and other transportation lines: Southern Pacific Railroad and steamers on Sacramento River.

Railroad station and estimated population June 30, 1919: Orland, 1,550; railroad flag stations with freight sidetracks, Greenwood, Wyo, and Malton.

WATER SUPPLY.

Source of water supply, Stony Creek.

Area of drainage basin: Above project diversion dams, 735 square miles; above feed canal diversion dam, 97 square miles; above East Park Dam (Little Stony), 102 square miles.

Annual run-off in acre-feet: Stony Creek, near Fruto (601 square miles), 1907 to 1913—maximum, 940,000; minimum, 135,200; mean, 500,000. Little Stony Creek, at East Park Dam (102 square miles), 1907 to 1918—maximum, 170,800; minimum, 12,600; mean, 61,300.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 20,533 acres.¹

Area under water-right applications, season of 1919: 18,922 acres.

Length of irrigation season, 1918: From April 1 to November 10—223 days.

Average elevation of irrigable area: 250 feet above sea level.

Rainfall on irrigable area: 1883 to 1918—average, 17 inches; 1918, 16.49 inches.

Range of temperature on irrigable area: 26° to 114° F.

Character of soil of irrigable area: Sandy and gravelly loam, silt loam, clay loam.

Principal products: Alfalfa, milo, citrus and other fruits, nuts, and vegetables.

Principal markets: San Francisco, Calif.; Portland, Oreg.; eastern markets.

LANDS OPENED FOR IRRIGATION.

Dates of orders and public notices: April 26 and May 24, 1916; February 8 and 21, 1917; March 22 and April 2, 1918.

Location of lands opened: Tps. 21 and 22 N., R. 2 W.; Tps. 21, 22, and 23 N., R. 3 W.; Tps. 22 and 23 N., R. 4 W., Mount Diablo base and meridian.

Limit of area of farm units: 40 acres, except that original subscribers are qualified to make water-right applications for an area not to exceed 160 acres.

Building charge per acre of irrigable land: \$44.

Charge per irrigable acre, under supplemental contract for lining canals and laterals with concrete: \$11.

Annual operation and maintenance charge: \$1.50 per irrigable acre, permitting delivery of 2½ acre-feet of water; 50 cents for the first, 25 cents for the second, 15 cents for the third, and 50 cents per acre-foot for all further quantities.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys made in 1906.

Construction recommended by board of engineers November 12, 1906.

Construction authorized by Secretary, October 5, 1907.

First irrigation by Reclamation Service, season of 1910.

East Park Dam completed July, 1910.

¹ Includes 320 acres of vested water rights and 46 acres of town and school sites.

Construction of East Park Feed Canal and second unit of the project authorized by Secretary July 25, 1913.

East Park Feed Canal completed June 30, 1915.

Entire project 81 per cent completed June 30, 1919, including supplemental construction.

IRRIGATION PLAN.

The irrigation plan of the Orland project provides for the storage of water in a reservoir controlled by East Park Dam on Little Stony Creek, about 40 miles southwest of Orland, Calif., and a feed canal 7 miles long connecting the storage basin with Stony Creek. The diversion works for the feed canal are located about 3½ miles west of Stonyford. For the irrigation of lands in the vicinity of Orland water is diverted from Stony Creek into the canal systems at two points—namely, Miller Buttes, 9½ miles northwest of Orland, for the South Canal system, and at the north side weir, 5 miles northwest of Orland, for the North Side Canal system. The South Canal system is to irrigate 13,000 acres on the south side and the North Canal system 7,000 acres on the north side of Stony Creek. The stored water is conveyed from East Park in the natural creek channel 41 miles to the Miller Buttes diversion and 45 miles to the north side weir, where it is taken out in distribution systems comprising 128 miles of canals and laterals. The plan also includes a high-line canal from which power may be developed for pumping. The United States intends, for and in connection with the project, to use the waste, seepage, spring, and percolating water arising within the same, and asserts a right thereto by virtue of its reservation of all unappropriated waters of the project source of supply and of its appropriation of said waters in accordance with the State law heretofore made for the purposes of the project.

The principal work now under way consists of placing concrete lining in the canal and lateral systems under a supplemental agreement with the water users.

The present limits of the Orland project may be considered as a unit of the Sacramento Valley project. It may be extended by constructing additional reservoirs on Stony Creek and its tributaries. The chief additional reservoir sites available are Millsite, on Stony Creek, near Fruto; Briscoe, on Briscoe Creek, near Elk Creek; Stonyford, on Stony Creek, at Stonyford, and Stony Gorge, on Stony Creek, near Elk Creek.

SUMMARY OF GENERAL DATA FOR ORLAND PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	1 20, 533
Private land June 30, 1919.....	1 20, 533
Acreage service could have supplied in season of 1918.....	20, 533
Estimated acreage service can supply in season 1919.....	20, 533
Estimated acreage service can supply in season 1920.....	20, 533
Acreage irrigated season of 1918.....	14, 764
Acreage cropped under irrigation season of 1918.....	12, 075
Acreage dry farmed season of 1918.....	2, 000

Crops:

Value of irrigated crops season of 1918.....	\$709, 172. 00
Value of irrigated crops per acre cropped.....	58. 73
Value of dry-farmed crops season of 1918.....	40, 000. 00
Value of dry-farmed crops per acre cropped.....	20. 00

Finances:

Net construction cost to June 30, 1919.....	920, 053. 69
Per cent completed on June 30, 1919.....	81. 00
Appropriated for fiscal year 1920.....	113, 000. 00
Estimated per cent complete by June 30, 1920.....	86. 00
Proposed appropriation for fiscal year 1921.....	120, 000. 00
Estimated per cent complete by June 30, 1921.....	93. 00
Announced construction charges per acre. {Original.....\$44. 00}	2 55. 00
{Supplemental.. 11. 00}	

¹ Includes 320 acres vested rights and 46 acres town and school sites.

² Includes supplemental construction.

Finances—Continued.

Appropriation fiscal year 1919.....	\$95,000.00	
Increase of compensation.....	3,162.81	
Increase miscellaneous collections.....	3,140.55	\$101,303.36
Expenditures chargeable to 1919 appropriation:		
Disbursements.....	56,701.80	
Transfers.....	6,210.90	
Current liabilities.....	3,839.83	
Contingent liabilities.....	144.26	66,896.79
Unencumbered balance on July 1, 1919.....		34,406.57
Repayments:		
Value of construction water-right contracts.....		1,046,033.23
Construction charges—		
Accrued to June 30, 1919.....	59,437.57	
Collected to June 30, 1919.....	59,437.57	
Operation and maintenance charges (public notice)—		
Accrued to June 30, 1919.....	56,728.36	
Collected to June 30, 1919.....	56,728.36	
Water rental charges—		
Accrued to June 30, 1919.....	119,870.22	
Collected to June 30, 1919.....	119,600.22	
Uncollected on June 30, 1919.....		270.00

CONSTRUCTION DURING FISCAL YEAR.

Lateral system.—Construction work in progress comprised the lining of the distribution system under supplemental agreement with the water users. It was planned during the year to do about 25 per cent of the total of the work covered by the agreement, but owing to labor conditions during the first half of the year and to a shortage of available funds, only about one-half of the work planned was completed.

The following work was accomplished:

Concrete lining (1½ inches thick) 2,464 cubic yards=58,882 square yards.
Minor structures, 14.

Surveys and investigations.—An examination of Stony Gorge dam site to determine its feasibility as regards foundations was made during the fall of 1918, and later a survey of the Millsite dam site was made. These sites control storage basins on Stony Creek.

SEEPAGE AND DRAINAGE.

Drainage conditions on the project are favorable. In general the soil is porous, is entirely free from deleterious salts, and has good surface and subsurface drainage. There are no seeped areas and no serious rising of ground water has occurred. The project is well supplied with natural drainage channels, and with proper care of these by the landowners when they prepare their land for irrigation practically all danger from waterlogging will be eliminated.

The drainage plans for the project provide for coordinating the work with the farmers as agricultural development advances, the problem consisting primarily of taking care of storm water during the winter season by building open drains where needed to connect with natural channels. Incidentally this will provide for any needed drainage during the irrigation season. As most of the project

requires little of this work, other than that which should be done by the farmers as a regular part of their plans in preparing their lands for irrigation, the situation can be best and most economically handled in cooperation with the landowners as development proceeds. This work was commenced in 1916 and will be continued as occasion arises, utilizing a small amount of funds provided for this purpose in fixing the building cost of the project.

ECONOMIES OF GOVERNMENT WORK.

There was an average increase of about 33 per cent in wages and 20 per cent in cost of materials over prewar times. The cost of work done by Government forces increased 12 per cent.

OPERATION AND MAINTENANCE.

The whole system, consisting of the storage works, feed canal, and 138 miles of canals and laterals, was operated.

Water for irrigation was turned in on April 1 and run until November 30. The water supply was about one-half that usually available, due to the shortage of the natural flow which is depended on for early irrigation. This shortage was general throughout the State, the supply being lower than for any previous year for which records are available. There was also a shortage of about 10 per cent in the storage at East Park, and it became necessary to apportion the supply to the irrigated lands early in the season. Due to the limited water supply, it is estimated that there was a loss of 20 per cent in the alfalfa crop, although there was ample water for all other crops.

There were no unusual conditions as regards maintenance work, and no renewals of any kind were required in connection with the upkeep of the system.

Historical review, Orland project.

Item.	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	20,183	* 20,533	* 20,533	* 20,533	* 20,533
Acreage irrigated.....	8,928	9,357	12,729	14,764	16,000
Miles of canal operated.....	115	128	138	138	140
Water stored (acre-feet).....	48,000	48,000	51,000	46,900	51,000
Water diverted (acre-feet).....	52,000	60,000	74,000	45,900	75,000
Water delivered to land (acre-feet).....	20,300	38,100	44,400	28,300	56,000
Per acre of land irrigated (acre-feet).....	3.40	4.07	3.50	2.91	3.50

¹ Estimated.

* Includes 320 acres of vested water rights and 46 acres of town and school sites.

SETTLEMENT AND DEVELOPMENT.

Over one hundred new families settled in the project during the year. These, for the most part, purchased improved farms. Sixty-two new farms were developed for irrigation, and two thousand acres were added to the irrigated area.

At the close of the fiscal year bank deposits in the town of Orland were \$1,100,000, an increase of over \$600,000 since 1916.

Settlement data, Orland project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project.....	509	509	699	725	846
Population.....	1,600	1,700	1,900	2,000	2,000
Number of irrigated farms.....	351	384	531	593	630
Operated by owners.....	320	342	483	549	580
Operated by tenants.....	31	42	48	44	50
Population.....	1,258	1,260	1,518	1,589	1,600
Number of towns.....	1	1	1	1	1
Population.....	1,500	1,550	1,550	1,600	1,650
Total population.....	3,100	3,250	3,460	3,600	3,650
Number of public schools.....	8	8	8	9	9
Number of churches.....	6	7	7	7	7
Number of banks.....	2	2	2	2	2
Total capital stock.....	\$141,000	\$141,000	\$141,000	\$141,000	\$141,000
Amount of deposits.....	\$395,000	\$445,000	\$755,000	\$950,000	\$1,100,000
Number of depositors.....	1,708	1,800	2,420	2,800	3,000

PRINCIPAL CROPS.

There was an increase of 2,400 acres in the cropped area for the calendar year 1918. Alfalfa continued to predominate with an acreage of 5,600. The next largest area was 3,000 acres of milo, which yielded 87,400 bushels of grain. There were also produced 34,200 bushels of barley, a crop little grown on the project lands since irrigation water was available. Although the estimated yield of alfalfa was 1,500 tons less than for 1917, returns for the crop were greater owing to increased prices. Returns from fruit and nuts were comparatively small as few orchards have reached the bearing age. Two experimental plots of cotton were planted from which encouraging results were obtained. The unit prices for all crops were greater than for the previous year, the estimated returns for the cropped area being \$58.73 per acre.

Dairying and live-stock production continued to be the principal industries of the project.

The inventory for stock and equipment shows a present value of \$638,000, an increase of \$89,000 for the year.

102 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Crop report, Orland project, California, 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	5,614	Ton.....	24,000	4.3	\$16.00	\$384,000	\$68.40
Other hay.....	859	do.....	1,200	1.4	18.00	21,600	25.15
Pasture.....	3,225					18,835	5.84
Corn, sorghum.....	3,014	Bushel.....	87,406	29.0	1.80	157,331	52.20
Wheat.....	80	do.....	1,852	23.2	2.20	4,074	50.93
Barley.....	1,257	do.....	34,220	27.2	1.00	34,220	27.22
Almonds.....	266	Pound.....	106,400	400.0	.224	23,940	90.00
Citrus fruits.....	121	do.....	70,000	578.5	.07	4,900	40.50
Deciduous fruits ¹	132	do.....	217,800	1,650.0	.04	8,712	66.00
Small fruits.....	6	do.....	6,450	1,075.0	.10	645	107.50
Prunes, dried.....	47	do.....	70,500	1,500.0	.10	7,050	150.00
Garden.....	273					24,215	88.70
Nursery.....	20					11,000	550.00
Miscellaneous.....	172					8,650	50.29
Less duplicated areas.....	3,011						
Total cropped acreage.	12,075	Total and average.....				700,172	58.78
						Areas.	Acres.
							Farms.
							Per cent of project.
Irrigated, no crop:							
Nonbearing orchard..	1,753	Irrigable area farms reported.....				16,000	80.0
Young alfalfa.....	712	Irrigated area farms reported.....				14,764	73.8
Not cropped.....	773	Under water-rights applications.....				14,524	72.6
Less duplicated areas.....	549	Under rental contracts.....				80	.8
		Under vested rights.....				190	2
Total irrigated acreage.	14,764	Cropped area farms reported.....				12,075	593
							60.2

¹ Small mixed orchards.

FINANCIAL STATEMENT.

Condensed balance sheet, Orland project, June 30, 1919.

Inventory of material and supplies.....	\$5,325.09
Accounts receivable:	
Current accounts due.....	\$298.64
Construction water-right charges unaccrued.....	986,595.66
Gross construction cost.....	1,048,298.20
Less construction revenue earnings.....	128,244.51
Net construction cost.....	920,053.69
Gross operation and maintenance cost.....	77,512.38
Less operation and maintenance revenues.....	1,897.70
Undelivered orders.....	75,614.68
Accounts payable.....	3,839.83
Contingent obligations.....	144.26
Collections and contracts of specific amounts for repayments to reclamation fund.....	1,103,557.21
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	1,142,775.82
Collection, transfer, and joint construction vouchers issued.....	262,285.10
Net investment.....	880,490.72

Feature costs of Orland project to June 30, 1919.

	Fiscal year 1919.	Total to June 30, 1919.
Examinations and surveys:		
Experimental investigations.....	\$5,361.35	\$10,369.11
Investigations unused sites.....		456.49
		10,825.60
Storage system:		
East Park Reservoir surveys.....		4,060.84
East Park Dam, spillway, and dikes.....		154,002.40
East Park Reservoir, clearing site.....		88,469.02
East Park spillway.....		29,470.79
East Park feed canal.....		91,186.23
Diversion dam.....		24,367.01
Headworks.....		6,704.16
Salt Creek siphon.....		4,747.74
Terminal chute.....		5,619.22
Salt Creek chute.....		3,463.45
County road bridges.....		2,350.01
Minor structures.....		3,137.47
Culverts.....		4,642.98
Raising spillway, East Park Dam.....		11,431.83
East Park feed canal, concrete lining.....		18,211.88
East Park Dam, additional gates.....		1,338.08
		453,203.06
Canal system:		
North Canal.....		24,600.96
South Canal.....		66,899.93
South diversion dam.....		26,060.08
South diversion conduit.....		1,707.88
South diversion headgates.....		4,242.55
South diversion sluiceway.....		5,049.76
North diversion dam.....		3,908.54
North diversion headworks.....		1,237.04
High line canal:		
South.....		21,172.61
Flume.....		7,074.97
Chute.....		2,178.28
Concrete lining.....		1,899.98
South Canal railroad crossing.....		673.45
South Canal excavating plant.....		4,916.21
		171,592.24
Lateral system:		
Laterals and sublaterals.....	2.93	88,427.27
Minor structures—		
Concrete.....	283.07	59,807.11
Pipe.....	64.16	6,300.53
Timber.....	59.35	2,245.14
Metal.....		146.63
14-inch concrete lining.....		95,077.68
24-inch pipe line on lateral 12.....		2,648.51
Railroad crossings under Southern Pacific tracks.....		6,251.43
	409.51	260,904.30
Flood protection, levees and dikes.....		499.72
Farm units.....		1,360.59
Permanent improvements:		
Buildings and permanent improvements.....		15,042.47
Power line, dismantled.....		271.72
Supplemental construction:		
14-inch concrete lining, canal system.....	8,646.75	8,646.75
14-inch concrete lining, lateral system.....	13,577.99	13,577.99
Operation and maintenance during construction.....		107,657.23
Gross cost of construction features.....	27,995.60	1,043,581.67
Plant accounts.....		4,622.32
Unadjusted clearing accounts.....		94.21
Gross construction cost.....	27,995.60	1,048,298.20
Less revenues accrued during construction period:		
Rentals of buildings.....		1,054.00
Rentals of grading and farming lands.....	749.00	4,317.00
Rentals of irrigation water.....		119,090.22
Contractors' freight refunds.....		1,829.82
Other revenues unclassified.....		1,953.47
Loss on hospital operations.....	203.93	
	545.07	128,244.51
Net construction cost to June 30, 1919.....	27,450.53	920,053.69

Cost statement by calendar years, Orland project.

Year ending Dec. 31—	Construc- tion.	Operation and maintenance.			Total cost.
		During construc- tion.	Under public notice.	Total.	
1906.....	\$7,213.19				\$7,213.19
1907.....	48,106.71				48,106.71
1908.....	117,351.53				117,351.53
1909.....	113,968.22				113,968.22
1910.....	173,159.82	\$1,456.88		\$1,456.88	174,616.70
1911.....	74,414.97	11,412.34		11,412.34	85,827.31
1912.....	16,488.92	18,342.71		18,342.71	34,831.63
1913.....	29,564.35	17,229.28		17,229.28	46,793.63
1914.....	177,089.08	19,814.16		19,814.16	196,903.24
1915.....	95,491.76	19,292.40		19,292.40	114,784.16
1916.....	34,034.80	24,444.74		24,444.74	58,479.54
1917.....	11,379.70	¹ 4,332.88	\$31,510.96	27,178.08	41,657.78
1918.....	15,760.58	¹ 2.40	31,083.79	31,081.39	46,841.97
Jan. 1 to June 30, 1919.....	18,880.81		14,917.63	14,917.63	33,798.44
Subtotal.....	935,924.44				1,121,094.05
Plant accounts June 30, 1919.....	4,622.32				4,622.32
Unadjusted clearing accounts.....	94.21				94.21
Total.....	940,640.97	107,657.23	77,512.38	185,169.61	1,125,810.58

¹ Deduct.*Cost statement by fiscal years, Orland project.*

Year ending June 30—	Construc- tion.	Operation and maintenance.			Total cost.
		During construc- tion.	Under public notice.	Total.	
1906.....	\$276.73				\$276.73
1907.....	10,019.66				10,019.66
1908.....	126,711.08				126,711.08
1909.....	59,402.42				59,402.42
1910.....	199,568.73	\$1,356.18		\$1,356.18	200,924.91
1911.....	103,524.38	4,141.36		4,141.36	107,665.74
1912.....	45,533.68	17,019.73		17,019.73	62,553.41
1913.....	11,780.79	20,872.72		20,872.72	32,653.51
1914.....	61,160.78	15,266.26		15,266.26	76,427.04
1915.....	203,470.40	20,240.24		20,240.24	223,710.64
1916.....	54,947.66	20,257.74		20,257.74	75,205.40
1917.....	21,684.91	13,127.43	\$12,046.62	25,174.05	46,858.96
1918.....	9,847.62	¹ 4,624.43	34,320.84	29,696.41	39,544.03
1919.....	27,965.60		31,144.92	31,144.92	59,140.52
Subtotal.....	935,924.44				1,121,094.05
Plant accounts June 30, 1919.....	4,622.32				4,622.32
Unadjusted clearing accounts.....	94.21				94.21
Total.....	940,640.97	107,657.23	77,512.38	185,169.61	1,125,810.58

¹ Deduct.

Estimated cost of contemplated work, Orland project, during fiscal year 1920.

Features.	Estimated cost during fiscal year 1920.	
	Sub-feature.	Principal feature.
Examination and surveys.....		\$400
Canal system: Concrete lining.....		20,000
Lateral system:		
Excavation and minor structures.....	\$500	
Concrete lining.....	6,400	
Operation and maintenance under public notice.....		6,900
Reimbursable accounts.....		39,000
		1,500
Total.....		67,800

Operating cost and revenues, Orland project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works:						
East Park Dam.....	\$1,314.10	\$4,759.69	\$6,073.79	\$3,051.11	\$7,743.45	\$10,794.56
East Park feed canal.....	702.38	399.30	1,101.68	1,143.44	1,228.86	2,372.30
	<u>2,016.48</u>	<u>5,158.99</u>	<u>7,175.47</u>	<u>4,194.55</u>	<u>8,972.31</u>	<u>13,166.86</u>
Canal system:						
North diversion dam.....		26.60	26.60	20.22	30.88	51.10
South diversion dam.....	2.07	10.71	12.78	2.07	86.13	88.20
	<u>2.07</u>	<u>37.31</u>	<u>39.38</u>	<u>22.29</u>	<u>117.01</u>	<u>139.30</u>
Lateral system:						
Northside.....	2,749.62	5,547.43	8,297.05	5,425.84	9,537.37	14,963.21
Southside.....	5,779.49	7,630.19	13,409.68	11,328.84	18,067.29	29,396.13
	<u>8,529.11</u>	<u>13,177.62</u>	<u>21,706.73</u>	<u>16,754.68</u>	<u>27,604.66</u>	<u>44,359.34</u>
Adjudication of water rights along Stony Creek.....		2,089.13	2,089.13		4,729.96	4,729.96
Farming operations, loss.....	73.08		73.08	140.67	58.62	199.29
Total.....	<u>10,620.74</u>	<u>20,463.05</u>	<u>31,083.79</u>	<u>21,112.19</u>	<u>41,482.56</u>	<u>62,594.75</u>
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			30,250.88			56,728.36
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			3.92			3.92
Rental of land and buildings during operating period.....			240.00			480.00
Rentals of irrigation water.....			150.00			510.00
Other revenues unclassified earned during operating period.....			59.96			213.43
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants (contra).....			¹ 1,325.28			¹ 1,305.28
Total.....			<u>29,399.48</u>			<u>58,630.43</u>
Difference (deficit).....			<u>1,684.31</u>			<u>3,964.32</u>

¹ Deduct.

COLORADO, GRAND VALLEY PROJECT.

S. O. HARPER, project manager, Grand Junction, Colo.

LOCATION.

County: Mesa.

Townships: 1 N., Rs. 1 E. and 1 to 3 W.; 2 N., Rs. 2 and 3 W.; 1 S., Rs. 1 E. and 1 W., Ute meridian. 9 S., Rs. 101 to 104 W.; 10 S., Rs. 98, 101, and 103 W.; 11 S., Rs. 98 and 99 W., sixth principal meridian.

Railroads: Denver & Rio Grande; Grand River Valley.

Railroad stations and estimated population, June 30, 1919: Palisade, 900; Clifton, 200; Grand Junction, 9,000; Fruita, 1,000; Loma, 40; Mack, 75.

WATER SUPPLY.

Source of water supply: Grand River.

Area of drainage basin: 8,550 square miles above Palisade.

Annual run-off in acre-feet of Grand River at Palisade, 1902 to 1918: Maximum, 5,466,600; minimum, 2,300,000; mean, 3,801,000.

Discharge, in second-feet, of Grand River at Palisade, 1902 to 1918: Maximum, 50,000; minimum, 1,100.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the Service is prepared to supply water, season of 1919: 43,400 acres.

Area under rental contracts season 1919 (to June 30): 17,500 acres.

Area in Palisade and Mesa County irrigation districts under special contracts, season of 1919: 8,400 acres.

Length of irrigation season: From April 1 to October 31, 214 days.

Average elevation of irrigable area: 4,700 feet above sea level.

Rainfall on irrigable area: For 26 years, average, 8.30 inches; 1918, 9 inches.

Range of temperature on irrigable area: -15° to 100° F.

Character of soil on irrigable area: Sandy loam, sandy mesas, and adobe.

Principal products: Alfalfa, sugar beets, grain, fruit, vegetables.

Principal markets: Large cities east of Rocky Mountains for fruit; other products, local.

LANDS OPENED FOR IRRIGATION.

Dates of orders: January 25, 1917; February 21, 1918; March 25, 1919.

Location of lands opened: Tps. 1, Rs. 1 and 2 W.; 2 N., Rs. 2 and 3 W.; 9 S., Rs. 103 and 104 W.

Limit of area of farm units: 40 to 80 acres.

Duty of water: 3.5 acre-feet per acre per annum at the farm.

Charges per acre of irrigable land: No lands have been opened under public notice and the building charge has not been announced. Water is furnished on a rental basis at the rate of 50 cents per acre-foot delivered at the farm.

In addition to the project lands, the service furnishes, beginning with the season of 1919, 120 second-feet of water for 8,400 acres included in the Palisade and Mesa County irrigation districts under special contracts with these districts.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in September, 1902.

Construction recommended by board of engineers December 15, 1908.

Purchase of rights of way authorized by Secretary November 4, 1911.

Construction authorized by Secretary September 23, 1912.

First irrigation by Reclamation Service season of 1915.

Cooperative drainage work in Grand Valley drainage district begun March, 1918.

Price-Stub pumping plant completed and water supplied to Palisade and Mesa County irrigation districts April, 1919.

Entire project 80.3 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Grand Valley project provides for the diversion of water from the Grand River by means of a diversion dam located about 8 miles northeast of Palisade, Colo., into a canal system on the north side of the river for the irrigation of lands lying north and west of Grand Junction, Fruita, and Mack, Colo. About 40,000 acres will be supplied by gravity and 10,000 acres by electrically operated pumping plants to be located on the gravity canal. Power for pumping will be developed in a power plant to be located at the upper portal of Tunnel No. 3. On the first 6 miles of the main canal located in the canyon of the Grand River there are three tunnels, respectively, 3,723, 1,655, and 7,292 feet long. The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

The diversion dam, the first 55 miles of the main canal, and the lateral system to serve 35,000 acres of the gravity unit of the project have been completed, with the exception of a few sublaterals and a large number of turnouts and weirs, which will be installed as needed. A pumping plant and other works to supply 8,400 acres in the Palisade and Mesa County irrigation districts have also been completed.

There remain to be completed the last 7 miles of the main canal, laterals to serve 5,000 acres of the gravity unit, the power and pumping systems, and such drainage and flood protection works as may be required.

**SUMMARY OF GENERAL DATA FOR GRAND VALLEY PROJECT
TO END OF FISCAL YEAR 1919.**

Areas:

Irrigable acreage when project is complete.....	50,000
Public land entered to June 30, 1919.....	13,991
Public land open to entry on June 30, 1919.....	1,015
Public land withdrawn on June 30, 1919.....	14,064
Private land June 30, 1919.....	20,930
Acreage service could have supplied in season of 1918.....	35,000
Estimated acreage service can supply in season 1919.....	¹ 43,400
Estimated acreage service can supply in season 1920.....	¹ 43,400
Acreage irrigated season of 1918.....	8,102
Acreage cropped under irrigation season of 1918.....	6,387

Crops:

Value of irrigated crops season of 1918.....	\$414,310.00
Value of irrigated crops per acre cropped.....	64.87

Finances:

Net construction cost to June 30, 1919.....	\$3,489,981.30
Per cent completed on June 30, 1919.....	80.3
Appropriated for fiscal year 1920.....	\$192,000.00
Estimated per cent complete by June 30, 1920.....	84.6
Proposed appropriation for fiscal year 1921.....	\$208,000.00
Estimated per cent complete by June 30, 1921.....	88.0
Appropriation fiscal year 1919.....	\$348,000.00
Deducted under 10 per cent provision.....	21,000.00
Increase, miscellaneous collections.....	28,848.34
Increased compensation.....	13,003.57
	<u>\$368,851.91</u>

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$225,548.69
Transfers.....	18,257.86
Current liabilities.....	44,072.00
	<u>287,878.55</u>

Unencumbered balance on July 1, 1919..... 80,973.36

Repayments:

Water rental charges—	
Accrued to June 30, 1919.....	43,495.95
Collected to June 30, 1919.....	39,753.13
Uncollected on June 30, 1919.....	3,742.82

¹Includes Mesa County and Palisade irrigation districts, 8,400 acres.

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	30, 400
Miles of drains built to June 30, 1919—	
Open.....	20. 0
Closed.....	1. 6
Total.....	21. 6
Estimated acreage protected by drains to June 30, 1919.....	5, 150
Estimated acreage to be protected by authorized system.....	10, 200
Cost of drainage works to June 30, 1919.....	\$197, 639. 56
Includes work performed in Grand Valley drainage district.	

CONSTRUCTION DURING FISCAL YEAR.

Grand River Dam.—No construction work was performed on this feature during the fiscal year, but the operating force completed the loading of the remaining second-hand equipment, the dismantling of the camp buildings, and the cleaning up of the site.

Canal system.—The only work undertaken on the canal system was in connection with the construction of the Price-Stub pumping plant and other facilities to supply the Palisade and Mesa County irrigation districts. The construction of the pumping plant, which is located at station 327 of the main canal near the lower portal of tunnel No. 3, was begun in January, 1919, and completed far enough to permit its operation to be commenced on April 14, 1919. This plant consists of a vertical turbine, direct connected to a centrifugal pump, utilizing 80 second-feet of water which is delivered to the Price ditch, of the Palisade irrigation district, through a fall of 17 feet to pump 25 second-feet of water against a 31-foot head into the Stub ditch, of the Mesa County irrigation district. The plant was given a final test in June, which indicated a maximum total efficiency of 68.4 per cent. The construction of this plant involved the excavation of 4,300 cubic yards of material in the intake structure, powerhouse foundations, and tail race and the placing of 375 cubic yards of concrete in the check, penstock, and powerhouse.

Six headgates were installed in the main canal through the Mesa County district for supplying the lands which could be watered by gravity, and one check, containing 84 cubic yards of concrete, was also constructed at station 660 of the main canal.

Lateral system.—Work on the lateral system during the year was confined to the construction of lateral extensions as required to supply new lands, and the installation of the necessary turnouts, weirs, and other minor structures. This work involved the excavation of 5,000 cubic yards of earth and the installation of 11 drops, 33 culverts, 32 checks, 6 flumes, 11 bridges, 1 siphon, 67 turnouts, and 108 weirs.

Surveys.—The irrigable area survey of the project was continued throughout the year. All field work on the gravity unit was completed, and the office work on inking and tracing the sheets and computing the areas was also practically complete at the end of the year. The total area covered by this survey to date is 48,000 acres.

SEEPAGE AND DRAINAGE.

Project lands.—The seepage which first developed with the operation of the irrigation system was due principally to leakage through shale cuts in the main canal. The area affected from this source has been

practically stationary during the year and in some parts of the project has slightly decreased on account of the silting up of the canal. With the increase of irrigation on the project, however, the water table is beginning to rise in a few new localities, and it is apparent that construction of a number of drains will have to be undertaken in the near future to protect some of the most valuable lands on the project. The total area of seeped land on the project has increased during the year from 225 to 400 acres. One short open drain 2,000 feet in length was constructed to protect an area in sec. 16, T. 1 N., R. 1 W., Ute meridian. Investigations of the seeped areas on the project are in progress, and plans are being made for all drains which it may be necessary to construct in the near future.

Cooperative drainage in Grand Valley drainage district.—The construction of the cooperative drainage system in the Grand Valley drainage district has been continued during the year with three drag-line excavators and one trenching machine. The work was retarded by the extreme shortage of labor, but in spite of this condition fair progress was made. The work completed during the year consisted of 16.4 miles of open drain, involving the excavation of 389,381 cubic yards of material. Five railroad culverts were completed, involving the placing of 370 cubic yards of concrete; and 11 highway bridges, 3 irrigation flumes, and 174 minor structures were installed. The use of a considerable mileage of tile drains was contemplated in the original contract with the district, but after the construction of a small amount of this type of drain, on account of the excessive cost and doubtful efficiency, it was decided to revise the plans to provide for the use of open drains in all cases, and a supplemental agreement was entered into with the district covering this change.

IRRIGATION DISTRICTS.

The contracts with the Palisade and Mesa County irrigation districts which were entered into in June, 1918, were confirmed by the district court on October 14, 1918. These contracts provide for delivering 120 second-feet of irrigation water to the districts through the works of the project and for the surrender to the United States of their power water rights amounting to 1,200 second-feet of the flow of the Grand River. Further negotiations with the Orchard Mesa district were had during the year looking toward the inclusion of this district in the project. A revised report and estimate of cost of reconstructing the irrigation system of this district was prepared in August, 1918, and reviewed by a board of engineers in June, 1919. At the end of the year no definite progress had been made toward the taking over of the irrigation district and its rehabilitation by the United States.

BOARD MEETINGS.

Date.	Topic.	Personnel.
June 2-6, 1919.....	{Report on reconstruction of Orchard Mesa Irrigation district.	{James Munn. C. T. Pease. J. L. Lytel.

OPERATION AND MAINTENANCE.

The irrigation system operated during the season of 1918 consisted of the first 55 miles of the main canal and 113 miles of laterals. The area actually irrigated consisted of 8,102 acres widely scattered through the project, making it necessary to operate practically the entire irrigation system to permit delivery of water to each of the farms under irrigation. Water was turned into the main canal on March 27, 1918, and shut out on November 15, the operation being extended for 15 days beyond the close of the regular season at the urgent request of a number of the new settlers who had not completed their cisterns in time to store their winter's water supply. Water was furnished throughout the season to the project lands on "supply on demand" basis at the rate of 50 cents per acre-foot. Five hundred and twelve acres of land in the Mesa County district were also furnished with a supplemental water supply under special contracts. The total quantity of water delivered to farms was 29,856 acre-feet, with a duty of 3.68 acre-feet per acre.

No difficulties were experienced in operating the system and water was not shut out of the main canal for a single day during the season. Russian thistles which blow into the main canal and laterals in large quantities interfered at times with the uniform delivery of water and the extreme scarcity of competent men to fill ditch riders' positions also made it difficult to furnish as satisfactory service as could be desired. The operation and maintenance force was employed during the irrigation season in patrolling the canals, regulating the delivery of water, performing minor repair work, and installing turnouts and measuring devices. During the nonirrigation season the same force was engaged in cleaning canals and laterals, burning weeds, installing new structures, and performing miscellaneous repair work.

Beginning with the season of 1919 water was supplied to a considerably increased acreage on the project as well as to the lands in the Palisade and Mesa County irrigation districts. This necessitated running a much larger head in the canal than had been carried in previous years and some difficulty was experienced with portions of the canal banks which had not been previously seasoned and puddled. One break occurred on May 25 on the canyon division of the main canal, which caused a two-days' interruption of water service and washed out a short section of the roadbed of the Denver and Rio Grande Railroad. A number of small leaks were discovered at different times, which were prevented from developing into serious breaks by the vigilance of the operating force. The interruption in service on account of these difficulties, however, was not serious and the loss and inconvenience from shortage of water were very slight.

Historical review, Grand Valley project.

Item.	1916	1917	1918	1919
Acreage for which service was prepared to supply water....	15,000	35,000	35,000	¹ 43,400
Acreage irrigated.....	1,741.5	5,289	8,102	¹ 22,400
Miles of canal operated.....	80	150.5	168	.....
Water diverted (acre-feet).....	30,813	55,891	74,852	.....
Water delivered to land (acre-feet).....	4,224	18,715	29,856	.....
Per acre of land irrigated (acre-feet).....	2.42	3.54	3.68	.....

¹ Estimated and includes Palsade and Mesa County irrigation districts, 8,400 acres.

SETTLEMENT.

Settlement of the project progressed rather slowly during the year, principally on account of the abnormal conditions due to the war and the extreme difficulty of securing labor for farm work. Considerable activity, however, has been noted in the western section of the project and the development, although not as rapid as hoped for, is proceeding on a conservative basis. Practically all of the desirable public lands under the project have been taken up and settlement activities were confined to the purchase of private lands and relinquishments. Sales of private lands have been limited but there have been a large number of transfers of relinquishments and assignments of excess units. The lands on the project are still held at very reasonable prices, and although settlement and development are not proceeding as rapidly as might be desired, the outlook is encouraging for the future.

Settlement data, Grand Valley project.

Item.	1916	1917	1918	1919
Total number of farms on project.....	900	900	900	900
Population.....	200	480	759	¹ 900
Number of irrigated farms.....	76	202	317	¹ 350
Operated by owners or managers.....	50	97	186	.....
Operated by tenants.....	26	105	131	.....
Population.....	168	480	759	.....
Number of towns.....	² 6	² 6	² 6	.....
Population.....	² 10,800	² 10,700	² 10,700	.....
Total population in towns and on farms.....	² 10,968	² 11,180	² 11,459	.....
Number of public schools.....	² 24	² 24	² 20	.....
Number of churches.....	² 28	² 28	² 28	.....
Number of banks.....	² 7	² 7	² 7	.....
Total capital stock.....	² \$387,000	² \$411,000	² \$432,000	.....
Total amount of deposits.....	² \$2,484,761	² \$2,525,675	² \$3,030,621	.....
Total number of depositors.....	² 7,260	² 7,462	² 8,681	.....

¹ Estimated.

² These items on lands adjacent to project.

CROPS.

The season of 1918 was about normal as far as weather conditions were concerned. The spring was somewhat late and was followed by a period of drought in April and May, which left the ground very dry and made it somewhat difficult to secure a good stand of some crops. The summer was warm and very favorable for crop growth and the long growing season in the fall before the first killing frost, on October 26, was especially favorable for harvesting late crops. The total area cropped was 6,387 acres, an increase of about 40 per cent over the previous season. The gross value of the crops produced

during the season amounted to \$414,310, an average of \$65 per acre. Sugar beets constituted the principal crop on the project, being valued at \$112,940. Apples, alfalfa, wheat, corn, peaches, potatoes, beans, pears, oats, and tomatoes were the other important crops, in the order named. There was a large increase in the acreage planted to alfalfa during the season and this crop is growing in importance. With the increase in the alfalfa acreage a marked increase in the number of live stock on the project is also noted and most of the new farmers are getting a good start in diversified farming combined with dairying and stock raising. The sugar-beet crop returns were very satisfactory and the project lands seem especially well adapted for the successful production of this crop.

The prospects for the season of 1919 are excellent. The first cutting of alfalfa was above the average in yield and quality. The yield of winter wheat was very satisfactory and all crops as a rule are in excellent condition. It is estimated that the area under cultivation on the project has been increased to 12,000 acres.

Crop report, Grand Valley project, Colorado, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa, hay.....	968	Ton.....	2,708	2.8	\$17.94	\$48,643	\$50.25
Apples.....	512	Pound.....	2,753,930	5,379	.0195	53,714	104.91
Barley.....	49	Bushel.....	396	8.1	1.65	655	13.36
Beans.....	238	do.....	2,970	12.5	5.94	17,641	74.05
Beets, sugar.....	1,042	Ton.....	11,294	10.8	10.00	112,940	108.39
Beet tops.....	1,042	do.....				6,252	6.00
Corn, Indian.....	749	Bushel.....	17,342	23.2	1.83	31,774	42.42
Corn, fodder.....	682	Ton.....	1,527	2.2	6.14	9,373	13.74
Fruits, small.....	14	Pound.....	25,500	1,821	.039	1,000	71.43
Garden.....	30	do.....				2,712	90.42
Hay.....	94	Ton.....	152	1.6	14.31	2,174	23.13
Oats.....	471	Bushel.....	10,302	21.9	1.02	10,522	22.34
Pasture.....	113	do.....				557	4.93
Peaches.....	70	Pound.....	562,210	8,032	.041	22,830	326.14
Pears.....	115	do.....	645,286	5,611	.027	17,150	149.13
Potatoes.....	205	Bushel.....	19,465	95	.92	17,833	86.99
Straw.....	2,101	Ton.....	1,138	.5	4.00	4,552	2.15
Tomatoes.....	81	do.....	647	8	14.00	9,058	111.83
Wheat.....	1,630	Bushel.....	22,742	14	1.89	43,097	26.44
Miscellaneous.....	54	do.....				1,833	33.96
Less duplicated areas.....	3,873						
Total cropped acreage..	6,387		Total and average.....			414,310	64.87
			Areas.		Acres.	Farms.	Percent of project.¹
Irrigated, no crop:							
Nonbearing orchard...		57					
Young alfalfa.....		700					
Ground fall-plowed...		1,658					
Less duplicated areas.....		700					
Total irrigated			Total irrigable area farms reported.....		13,724	317	27.5
acreage.....		8,102	Total irrigated area farms reported.....		8,102	309	16.2
			Under rental contracts.....		8,102	309	16.2
			Total cropped area farms reported.....		6,387	276	12.8

¹ 50,000 acres (estimated).

PUBLIC NOTICES AND ORDERS.

ORDER, MARCH 25, 1919.

1. Order of February 21, 1918, amended.—Notice is hereby given that the order of February 21, 1918, opening lands on the Grand Valley project, Colorado, is modified in respect to the application of the initial payment of \$3 per acre required to be paid in pursuance of said order, as a minimum charge for water of \$1 per irrigable acre for each of the years 1918, 1919, and 1920, so as to provide that when lands have been, or hereafter are, entered after September 1 of any year, and therefore do not secure the benefits of water for irrigation purposes in that year, the payment of the \$3 per acre made at the time of entry will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges, for the three-year period beginning with the year following that in which entry was made, in accordance with the minimum charges which have been, or hereafter may be, established by the Secretary of the Interior for similar lands on the project. For lands which have been, or hereafter are entered on or before September 1 of any year the said payment of \$3 per acre will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges, beginning with the year in which the entry was made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Grand Valley project, June 30, 1919.

Cash.....	\$427.10
Inventory of materials and supplies on hand.....	59,716.42
Accounts receivable.....	4,731.81
Construction work contracted.....	108.00
Gross construction cost.....	\$3,545,157.26
Less construction revenue earnings.....	55,176.96
Net construction cost.....	<u>3,489,981.30</u>
Accounts payable.....	39,785.90
Contingent obligations.....	530.10
Collections and contracts of specific amounts for repayments to reclamation fund.....	124.00
Capital investment:	
Disbursement and transfer vouchers received.....	\$3,638,274.68
Collection and transfer vouchers issued.....	126,755.06
Net investment.....	<u>3,514,519.63</u>

138554—19—8

Feature costs of Grand Valley project to June 30, 1919.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys, project.....	\$758.73	\$71,462.38
Pumping for irrigation, surveys.....	262.49	5,969.38
Canals system:		
Grand River diversion dam.....	30.06	500,466.93
Canyon division, headworks to Pallsade.....		988,282.10
Division No. 2, Pallsade to Indian Waste.....	56,766.94	537,905.72
Division No. 3, Indian Waste to Little Salt Wash.....	3.55	292,350.34
Division No. 4, Little Salt Wash to end.....	357.56	344,535.58
	57,158.11	2,656,540.67
Laterals system:		
District No. 1, Indian Wash to Big Salt Wash.....	4,077.80	135,854.13
District No. 2, Big Salt Wash to East Salt Creek.....	5,758.47	117,040.10
District No. 3, East Salt Creek to West Salt Creek.....	2,007.00	68,640.80
	11,843.27	321,535.03
Drainage system:		
Project—		
Surveys.....	429.43	7,546.99
Drains.....	2,334.66	3,799.67
Grand Valley drainage district: Surveys and plans for complete system.....		25,383.58
Cooperative drainage in Grand Valley drainage district:		
Surveys and contract payments.....	485.30	15,017.40
Drains.....	120,241.87	145,891.92
	123,491.26	197,639.56
Flood protection: Protecting wasteway channels.....	1,146.25	13,627.16
Farm units: Survey of irrigable land.....	13,053.71	37,861.45
Permanent improvements:		
Permanent camp No. 5.....	1,046.17	5,233.89
Permanent camp No. 7.....	1,150.89	6,778.21
Ditch riders' quarters.....	287.77	3,826.39
Miscellaneous buildings.....	443.41	1,244.66
	2,928.24	17,083.15
Telephone system.....		11,794.30
Operation and maintenance during construction (water rental):		
Project.....	56,095.33	144,629.11
Price—Stub.....	974.74	974.74
	57,070.07	145,603.85
Total cost of construction features.....	267,712.13	3,479,126.93
Balance in plant and clearing accounts on June 30, 1919.....		66,030.33
Gross construction cost to June 30, 1919.....	267,712.13	3,545,157.26
Less revenues earned during construction period —		
Rentals of buildings.....	730.41	2,791.75
Rentals of grazing and farming lands.....	21.00	1,484.74
Rentals of power and light.....	259.92	259.92
Rentals of irrigation water.....	17,688.64	43,495.95
Rentals of telephone and tolls.....		15.65
Contractors freight refunds.....	265.35	8,067.08
Revenues, miscellaneous.....	1258.67	143.07
Sales of Warren Act water.....	4,727.80	4,727.80
Profit on hospital operations.....	440.59	4,797.19
Losses on operations, unclassified.....	383.91	110,607.19
	24,258.95	55,175.96
Net cost of construction of project to June 30, 1919.....	243,453.18	3,489,981.30

¹ Deduct.

Cost statement by calendar years, Grand Valley project.

	Construction.	Operation and maintenance during construction.	Total cost.
Period prior to Dec. 31, 1911.....	\$82,366.98	.....	\$82,366.98
Year ending Dec. 31—			
1912.....	245,449.57	.....	245,449.57
1913.....	432,928.81	.....	432,928.81
1914.....	1,058,596.01	.....	1,058,596.01
1915.....	818,600.39	.....	838,600.39
1916.....	277,225.60	\$19,458.25	296,683.85
1917.....	119,338.33	48,150.61	167,488.94
1918.....	146,721.84	47,525.32	194,247.16
January 1 to June 30, 1919.....	132,295.55	30,469.67	162,765.22
Subtotal.....	3,333,523.08	145,603.85	3,479,126.93
Plant and clearing accounts to June 30, 1919.....	66,030.33		66,030.33
Total.....	3,399,553.41	145,603.85	3,545,157.26

Cost statement by fiscal years, Grand Valley project.

	Construction.	Operation and maintenance during construction.	Total cost.
Prior to June 30, 1912.....	\$265,461.64	.....	\$265,461.64
Year ending June 30—			
1913.....	188,772.93	.....	188,772.93
1914.....	668,889.51	.....	668,889.51
1915.....	1,357,472.93	.....	1,357,472.93
1916.....	324,814.92	\$4,650.40	329,465.32
1917.....	226,436.03	29,305.01	255,741.04
1918.....	91,033.06	54,578.37	145,611.43
1919.....	210,642.06	57,070.07	267,712.13
Subtotal.....	3,333,523.08	145,603.85	3,479,126.93
Plant and clearing accounts to June 30, 1919.....	66,030.33		66,030.33
Total.....	3,399,553.41	145,603.85	3,545,157.26

Estimated cost of contemplated work, Grand Valley project, during fiscal year 1920.

Features.	Sub-feature.	Principal feature.
Examination and surveys.....		\$500
Lateral system:		
Surveys.....	\$300	
Excavation.....	1,700	
Minor structures.....	7,000	9,000
Drainage system:		
Project drains.....	5,000	
Grand Valley Drainage district.....	75,000	
State lands.....	20,000	100,000
Flood protection.....		1,000
Farm units.....		1,000
Permanent improvements: Ditch riders' cottages.....		1,500
Operation and maintenance under water rental.....		60,000
Reimbursable accounts.....		1,000
Total.....		174,000

COLORADO, UNCOMPAHGRE PROJECT.

F. D. PYLE, project manager, Montrose, Colo.

LOCATION.

Counties: Montrose and Delta.
Townships: 15 S., Rs. 94 to 96 W., sixth principal meridian; 48 to 51 N., Rs. 7 to 12 W., New Mexico meridian.
Railroad: Denver & Rio Grande.
Railroad stations and estimated population June 30, 1919: Montrose, 3,600; Olathe, 650; and Delta, 2,700.

WATER SUPPLY.

Sources of water supply: Gunnison and Uncompahgre Rivers.
Area of drainage basins: Gunnison River, 3,850 square miles; Uncompahgre River, 500 square miles.
Run-off in acre-feet, April to October, inclusive, Gunnison River at River Portal (3,850 square miles), 1905 to 1918: Maximum, 1,737,300; minimum, 844,550; mean, 1,337,270. Uncompahgre River at Colona, near Fort Crawford (500 square miles), 1903 to 1918: Maximum, 256,700; minimum, 128,700; mean, 172,500.

LANDS OPENED FOR IRRIGATION.

Departmental order of March 26, 1919, opened to entry 8 farm units on April 25, 1919. Departmental order of April 9, 1919, opened to entry 3 farm units on May 2, 1919. All lands irrigated from canals operated by the Reclamation Service were furnished water under rental contracts, except in a few instances where water was appurtenant to outstanding stock or deeds issued by canal companies whose properties had been transferred to the Government.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: Estimated at 100,000 acres.
Area under rental contracts, season of 1919: Estimated at 80,000 acres.
Area irrigated, season of 1918: 58,270 acres.
Length of irrigating season: From April 1 to October 31, 214 days, on all Government canals except the Loutsenhizer, under which the season ends November 15.
Average elevation of irrigable area: 5,500 feet above sea level.
Rainfall on irrigable area: 19 years, average, 9.53 inches; 1918, at Montrose, 11 inches.
Range of temperature on irrigable area: -25° to 98° F.
Character of soil of irrigable area: Red sandy gravel, adobe, and clay loam.
Principal products: Alfalfa, grain, fruits, sugar beets, potatoes, onions, and vegetables.
Principal markets: Denver, Omaha, and Kansas City for live stock; Denver, Missouri River points, and Texas for fruit, potatoes, and onions; local mining camps for garden truck and small fruits.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in June, 1901.
Construction recommended by director March 7, 1903.
Construction conditionally authorized by Secretary, March 14, 1903.
Construction authorized by Secretary, June 7, 1904.
Contract for construction of Gunnison Tunnel approved October 18, 1904.
First irrigation by Reclamation Service, season of 1908.
Gunnison Tunnel completed for present use June, 1910.
Gunnison River diversion dam completed January, 1912.
Entire project 98.7 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan for the Uncompahgre project provides for the diversion of water from the canyon of the Gunnison River by means of a tunnel 6 miles long and a canal 11 miles long to supplement the flow of the Uncompahgre River, and in addition thereto the utilization of all waste, seepage, spring, percolating, and return water arising within the project, in the irrigation of lands within the Uncompahgre Valley. To distribute the waters of the Uncompahgre and Gunnison Rivers thus combined, 7 other canal systems were constructed, all of which take water from the Uncompahgre River, except the West Canal, which can divert water from the South Canal by a flume over the Uncompahgre River or can divert from the Uncompahgre River by a feeder canal. The construction of the various canal systems included the purchase, enlargement, and extension of the more important private ditches acquired by the United States.

Surveys and diamond-drill investigations for Taylor Park Reservoir have been completed, but no construction work has been undertaken. The Gunnison Tunnel is complete. The South, West, Montrose & Delta, Loutsenhizer, Selig, Ironstone, East, and Garnet canal systems are complete except for the excavation, enlargement, and extension of a few small laterals and the installation of minor structures. Purchase has been made of over 85 per cent of the Loutsenhizer water rights and of shares pertaining to the Ironstone and Ironstone extension canals.

**SUMMARY OF GENERAL DATA FOR UNCOMPAHGRE PROJECT TO
END OF FISCAL YEAR.**

Areas:

Irrigable acreage when project is completed.....	100,000
Public land entered to June 30, 1919.....	20,080
Public land open to entry on June 30, 1919.....	2,705
Public land withdrawn on June 30, 1919.....	1,445
Private land June 30, 1919.....	75,770
<hr/>	
Acreage service could have supplied in season of 1918.....	100,000
Estimated acreage service can supply in season 1919.....	100,000
Estimated acreage service can supply in season 1920.....	100,000
Acreage irrigated season of 1918.....	58,270
Acreage cropped under irrigation season of 1918.....	57,310

Crops:

Value of irrigated crops season of 1918.....	\$3,302,460.00
Value of irrigated crops per acre cropped.....	57.62

Finances:

Net construction cost to June 30, 1919.....	\$6,574,514.25
Per cent completed on June 30, 1919.....	98.7
Appropriated for fiscal year 1920.....	\$206,000.00
Estimated per cent complete by June 30, 1920.....	99.0
Proposed appropriation for fiscal year 1921.....	\$174,000.00
Estimated per cent complete by June 30, 1921.....	99.3
Appropriation fiscal year 1919.....	\$185,000.00
Increased compensation.....	10,938.89
Increased miscellaneous collections.....	174,278.02
	<hr/>
	\$370,216.91

Expenditures chargeable to 1919 appropriation:

Disbursements.....	163,440.04
Transfers.....	12,891.52
Current liabilities.....	15,253.45
Contingent liabilities.....	25.00
	<hr/>
	191,610.01

Unencumbered balance on July 1, 1919.....	178,606.90
---	------------

Repayments—Water-rental charges:

Accrued to June 30, 1919.....	\$741,376.38
Collected to June 30, 1919.....	741,166.38
	<hr/>
Uncollected on June 30, 1919.....	210.00

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	16,000
Cost of drainage works to June 30, 1919.....	\$3,940. 63
No drainage work undertaken except for minor investigations.	

CONSTRUCTION DURING FISCAL YEAR.

Taylor Park Reservoir.—Hydrographic investigations were continued.

Gunnison Tunnel.—Two gatehouses were constructed at River Portal—one over the Gunnison Tunnel headworks and the other over the sluice gates. Gasoline engine-driven lifting devices were installed for operating the Gunnison Tunnel gates and sluice-way gates.

South Canal system.—Two concrete headgates, having 4 by 5 foot cast-iron gates, located on the South Canal to feed the Highline lateral, were completed; also a concrete headgate, having a 2 by 2 foot cast-iron gate, to deliver water to the A C lateral. One bridge, 4 drops, 1 flume, 1 canal turnout, 6 farm turnouts, and 2 weirs, all timber structures, were completed.

West Canal system.—Four farm turnouts and 2 weirs, all timber structures, were completed.

Montrose & Delta Canal system.—A sluice gate was installed in the Montrose & Delta headworks, involving the placing of 4,400 feet board measure of lumber and 692 pounds of castings. Two bridges, 1 check, 2 culverts, 1 drop, 1 flume, 1 canal turnout, 25 farm turnouts, and 11 weirs, all timber structures, were completed.

Loutsenhizer Canal system.—Two small flumes, 3 farm turnouts, and 2 weirs, all timber structures, were completed. The acquisition of outstanding water rights was continued.

Selig Canal system.—One bridge, 11 checks, 3 drops, 1 flume, 22 farm turnouts, and 1 wasteway, all timber structures, were completed.

Ironstone Canal system.—The construction of the Ironstone extension lateral was completed. The excavation was completed under the following field contracts:

Schedule.	Cubic yards.	Contractor.	Date of contract.	Date of completion.
1, 2.....	8,576	John J. Halliday.....	Oct. 25, 1918	Mar. 22, 1919
4.....	6,725	do.....	Apr. 29, 1918	June 1, 1918
5.....	6,878	R. E. Wear.....	May 7, 1918	June 21, 1918
6.....	4,384	John J. Halliday.....	May 18, 1918	June 12, 1918
7.....	5,213	E. T. Berry.....	May 16, 1918	July 22, 1918
8, 9.....	7,561	do.....	May 27, 1918	Jan. 5, 1919

The principal structures installed on the Ironstone Extension lateral consisted of a timber flume 10 feet wide, 4 feet deep, and 84 feet long, containing 10,600 feet board measure of lumber, and 5 semi-circular No. 84 metal flumes, having a total length of 938 feet; 14,500 feet board measure of lumber, and 71 cubic yards of rock masonry were used in the construction of the flumes. Ten bridges, 2 checks, 7 culverts, 6 drops, 8 flumes, 36 farm turnouts, 2 wasteways, and 11 weirs, all timber structures, were completed. The acquisition of outstanding shares of Ironstone and Ironstone Extension stock was continued.

East Canal system.—One bridge, 2 checks, 1 drop, 1 flume, 1 canal turnout, 11 farm turnouts, and 4 weirs, all timber structures, were completed.

Garnet Canal system.—Six farm turnouts, all timber structures, were completed.

Drainage system.—One observation of the fluctuation of the water level in the drainage test wells was made.

SEEPAGE AND DRAINAGE.

Considerable areas in the Uncompahgre Valley are suffering from an excess of ground water, largely caused by excessive and careless use of irrigation water. This condition is no doubt aggravated by the system in use of furnishing water on a continuous-flow basis. Seeped areas contain excessive quantities of alkali, and are not confined to the river bottoms or other low areas. About 7,500 acres have been drained in the valley. Some of this work was done by individual farmers, but all the larger undertakings were carried through by drainage contractors.

Preliminary drainage surveys were begun during the spring of 1915, but no drainage construction has been undertaken by the service.

OPERATION AND MAINTENANCE.

During the season of 1918 the service supplied and distributed water for the irrigation of 58,270 acres of land—4,632 acres of which were supplied from the South Canal system, 4,794 acres from the West Canal system, 19,466 acres from the Montrose & Delta Canal system, 4,450 acres from the Loutsenhizer Canal system, 5,319 acres from the Selig Canal system, 12,613 acres from the Ironstone Canal system, 5,378 acres from the East Canal system, and 1,618 acres from the Garnet Canal system. The Logan and the North Mesa Canals, the owners of which have entered into an agreement to transfer them to the United States, were supplied with Gunnison water. Gunnison water was also rented to the Ouray Ditch Co.

During the season 423,050 acre-feet of water were diverted into the canals operated by the service, of which 367,144 acre-feet were delivered to the land. All water was furnished on a continuous flow rental basis. The charge was \$100 per second-foot for the season for all consumers under all canal systems, except as noted below: The consumers under the Loutsenhizer, Selig, and East Canal systems possessing water rights in the old Loutsenhizer Canal were furnished at the rate of \$20 per second-foot for Uncompahgre priority water and \$80 additional per second-foot for supplemental water. A few consumers under the Montrose & Delta Canal system were furnished Uncompahgre priority water at rates varying from \$36 to \$40 per second-foot, depending upon the terms of the contracts they held with the Montrose & Delta Canal Co. at the time of its purchase by the Government. Water appurtenant to the stock of the Ironstone Canal system was carried for \$5 per share; Ironstone Extension stock for \$3 per share; Delta Chief stock for \$2 per share; Home Run stock for \$1.50 per share, and Chipeta stock for 25 cents per share. Private canals were furnished Gunnison water at the South Canal outlet at the rate of \$80 per second-foot for the season. Water was diverted into the Chipeta-Beaudry ditch from the Garnet Canal,

under informal contract, for \$100 for the season. All water rentals were paid in advance.

Except for the heavy maintenance work on the South Canal and the Montrose & Delta slides, the season was good for the operation and maintenance of the canal systems; there was no serious interference with the delivery of water. However, the season was most expensive, on account of the amount of work done, as the high cost of materials and the high cost and scarcity of labor made it necessary to do a considerable portion of the work at a time when there was no competition with the farmers for labor. The routine maintenance work consisted of cutting brush from canal banks, spading laterals, removing weeds after wind storms, protecting the head gates during high water, removing gravel near the head works of canals, raising banks, and replacing structures.

Water was turned out of the South Canal on July 10 and 11, August 14 and 15, September 9 to 11, and June 13 to 16, in order to make minor repairs to concrete lining.

A flood in the Loutsenhizer Arroyo in July and another one in September made it necessary to reconstruct the flume where the Garnet Canal crosses the arroyo. On September 9 flood water entered the South Canal from a small gulch at the foot of the incline above tunnel No. 1 and caused the bulging of about 50 feet of sidewall. Temporary repairs were made so that the water service could be continued. Permanent repairs were completed in December.

During November and December the floor of the Montrose & Delta weir was covered with concrete, repair work was commenced on the South Canal concrete lining, the overflow weir at the Garnet dam was concreted, and gravel was cleaned from the Montrose & Delta, Loutsenhizer, Selig, Ironstone, and East Canal headworks. The West Canal and the King lateral extension were thoroughly cleaned in places where the canals were gradually filling up with gravel through gravel cuts. Practically all of the metal flumes were cleaned, repaired, and tarred. A portion of the metal flumes at each end of the High Mesa siphon was replaced with wood. During February about 50 feet of sidewall lining on the South Canal near mile post 4 bulged on account of water from melting snow finding its way behind the concrete. This work was repaired in April. Improvements were installed at the Montrose & Delta and Selig headworks in order to better control the gravel. Steel rails were driven above the South Canal outlet to control the Uncompahgre River and prevent it undermining the outlet structure.

Historical review, Uncompahgre project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	52,338	62,147	77,713	90,000	100,000	100,000
Acreage irrigated.....	33,873	41,463	49,273	53,108	58,270	61,000
Miles of canal operated.....	279.5	355.8	406.45	415	413	425
Water diverted, acre-feet.....	183,342	264,090	329,564	368,148	423,050	430,000
Water delivered to land, acre-feet.....	171,268	231,271	299,432	316,365	367,144	366,000
Per acre of land irrigated, acre-feet.....	5.06	5.56	6.08	5.90	6.30	6.00

¹ Estimated.

SETTLEMENT.

Departmental order of March 26, 1919, opened to entry 8 farm units on April 25, 1919, by a drawing at the local land office. Six of these farm units had been previously farmed under leases during the seasons of 1917 and 1918. There were 30 contestants for three entries and two entries have been made since that date. Departmental order of April 9, 1919, opened to entry 3 farm units on May 2, 1919. As there was only one applicant for each unit, there was no drawing at the land office. Fair progress has been made by entrymen in developing the lands above mentioned and lands opened to entry by departmental order of February 21, 1918.

The agreement between the United States and the water users' association, executed on May 7, 1918, provides for the operation and maintenance of the project at cost to the water users, and also that the first payment of the construction charge will become due December 1, 1922.

Mr. H. A. Lindgren, project agricultural advisor, continued his successful work in connection with the promotion of feeding and milking tests and in the importation of high grade and registered stock. He was also instrumental in the organization of a bull association on the project. There is no experimental farm on the project but considerable interest is manifested in the experimental work of the Colorado Agricultural College. Specialists have been sent out by the Department of Agriculture, the Colorado State Agricultural College, and the agricultural department of the Denver & Rio Grande Railroad Co. in the interests of better farming. Domestic science, corn, potato, pig, and other clubs have been organized in the district schools. Cooperative shipping associations have been formed among the farmers, and a live stock protective health association, which employs a competent veterinarian to attend to the health of the live stock of the 200 members of the association. Both Montrose and Delta counties had the services of competent county agents, who have helped materially in promoting the agricultural and live-stock industries.

Settlement data, Uncompahgre project.

Item.	1914	1915	1916	1917	1918
Total number of farms on project.....	910	1,107	1,320	1,402	1,514
Population.....	2,942	3,561	4,403	4,613	5,279
Number of irrigated farms.....	910	1,107	1,320	1,402	1,514
Operated by owners or managers.....	551	615	713	809	949
Operated by tenants.....	359	492	607	593	565
Population.....	2,942	3,561	4,403	4,613	5,279
Number of towns.....	3	3	3	3	3
Population.....	6,500	6,500	6,700	6,950	6,950
Total population in towns and farms.....	9,442	10,061	11,103	11,563	12,229
Number of public schools.....	22	24	26	26	26
Number of churches.....	26	26	27	27	27
Number of banks.....	8	8	8	8	8
Total capital stock.....	\$360,000	\$360,000	\$360,000	\$515,700	\$588,800
Amount of deposits.....	\$1,692,612	\$1,556,963	\$2,750,000	\$4,858,903	\$4,484,626
Number of depositors.....	5,950	5,975	8,100	9,500	10,000

CROPS.

The season of 1918 was excellent for alfalfa, beans, sugar beets, oats, onions, and wheat. It was fair for apples and potatoes. In general the prices received for all crops were good. There was a large increase in the acreage of wheat due to the national demand for more wheat and the guaranteed price. The prices received for products averaged about the same as in 1917, or about 100 per cent higher than in previous years. Labor was scarce and high priced. This condition did not seriously affect the production of crops. A heavy freeze on June 1 and 2, 1919, practically ruined the fruit crop on the south half of the project and did some damage to the fruit on the north half of the project. Considerable damage was also done to potatoes, alfalfa, and early vegetables.

Crop report, Uncompahgre project, Colorado, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	21,860	Ton.....	72,026	3.3	\$11.07	\$797,409	\$36.48
Alfalfa seed.....	115	Bushel.....	352	3.1	12.44	4,380	38.09
Apples.....	2,162	Pound.....	10,573,488	4.891	.018	191,740	88.69
Barley.....	348	Bushel.....	10,997	31.6	1.64	18,077	51.95
Beans.....	1,299	..do.....	19,211	14.8	4.21	80,797	62.20
Beets, sugar.....	1,083	Ton.....	11,143	10.3	10.04	111,832	103.26
Clover hay.....	53	..do.....	80	1.5	10.70	856	16.15
Clover seed.....	25	Bushel.....	70	2.8	15.19	1,063	42.52
Corn, Indian.....	1,817	..do.....	55,923	30.8	1.55	86,976	47.87
Corn fodder.....	228	Ton.....	1,179	5.2	2.79	3,290	14.43
Corn ensilage.....	555	..do.....	4,060	7.3	9.67	39,279	70.77
Fruits, small.....	56	Pound.....	112,180	2,003	.08	8,898	158.89
Garden.....	127	..do.....				11,997	94.46
Hay.....	306	Ton.....	537	1.8	11.60	6,230	20.36
Oats.....	5,461	Bushel.....	191,994	35.2	1.01	194,844	35.68
Onions.....	304	..do.....	89,254	293.6	.55	49,045	161.33
Pasture.....	2,264	..do.....				27,171	12.00
Peaches.....	59	Pound.....	35,580	603	.054	1,935	32.80
Pears.....	9	..do.....	27,360	3,040	.042	1,142	126.89
Peas.....	1	Bushel.....	20	20	3.00	60	60.00
Prunes.....	1	Pound.....	1,500	1,500	.083	50	50.00
Potatoes, white.....	6,514	Bushel.....	1,170,174	179.6	.82	959,222	147.26
Rye.....	24	..do.....	266	11.1	1.55	413	17.21
Wheat.....	13,176	..do.....	342,562	26.0	1.95	667,552	50.66
Miscellaneous.....	148	..do.....				38,203	258.13
Less duplicated areas.....	685	..do.....					
Total cropped acreage.....	57,310		Total and average.....			3,302,460	57.62
			Areas.		Acres.	Num- ber of farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area of farms reported.....		76,222	1,514	76
Nonbearing orchard.....		183	Total irrigated area of farms reported.....		58,270	1,514	58
Young alfalfa.....		3,631	Under rental contracts.....		58,270	1,514	58
Ground fall plowed....		2,828	Total cropped area of farms reported.....		57,310	1,514	57
Less duplicated areas.....		5,682					
Total irrigated acreage.....	58,270						

PUBLIC NOTICES AND ORDERS.

ORDER, MARCH 25, 1919.

1. **Order of February 21, 1918, amended.**—Notice is hereby given that the order of February 21, 1918, opening lands on the Uncompahgre Valley project, Colorado, is modified in respect to the application of the initial payment of \$3 per acre required to be paid in pursuance of said order, as a minimum charge for water of \$1 per irrigable acre for each of the years 1918, 1919, and 1920, so as to provide that when lands have been, or hereafter are, entered after June 15 of any year, and therefore do not secure the benefits of water for irrigation purposes in that year, the payment of the \$3 per acre made at the time of entry will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges, for the three-year period beginning with the year following that in which entry was made, in accordance with the minimum charges which have been, or hereafter may be, established by the Secretary of the Interior for similar lands on the project. For lands which have been, or hereafter are, entered on or before June 15 of any year the said payment of \$3 per acre will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges, beginning with the year in which the entry is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

ORDER, MARCH 26, 1919.

1. **Public lands for which entry may be made and water is available.**—In pursuance of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly sections 1, 10, and 11 of the reclamation extension act of August 13, 1914 (38 Stat., 686), it is announced that water is available and entry may be made in accordance with this order on the following-described farm units on the Uncompahgre Valley project, Colorado, to wit:

Farm unit.	Description.	Acres irrigable.
C	SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 4, T. 49 N., R. 10 W., N. M. P. M.	30
E	E. $\frac{1}{4}$ NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 20, T. 50 N., R. 9 W., N. M. P. M.	29
C	N. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 20, T. 50 N., R. 9 W., N. M. P. M.	36
C	E. $\frac{1}{4}$ SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 32; NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 31, T. 50 N., R. 9 W., N. M. P. M.	85
N	SE. $\frac{1}{4}$ NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 9, T. 50 N., R. 11 W., N. M. P. M.	62
A	SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 25, T. 50 N., R. 11 W., N. M. P. M.	8
H	Lots 3 and 4, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 31, T. 15 S., R. 94 W., sixth P. M.	78
E	SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 20, T. 15 S., R. 95 W., sixth P. M.	33

Diagrams showing the above-described farm units were approved by the department on the date of this order, and are on file in the office of the project manager, United States Reclamation Service, Montrose, Colo., and at the local land office, Montrose, Colo.

2. **When and how to make entry for public land.**—Homestead entries for the farm units shown on said plats may be made beginning April 25, 1919, at 9 o'clock a. m., at the said local land office.

Every person desiring to acquire any of said public lands must execute a homestead application subject to the provisions of the reclamation law in manner required by law, which, with the required fees and commissions, accompanied by certificate of the project manager as to the filing of application for rental of water and payment of water-rental charges as hereinafter provided, may be presented to said local land office, in person, by mail, or otherwise, within a period of six days prior to the opening, to wit: On and from April 19, 1919, to and including 9 o'clock a. m. April 25, 1919. Applications presented after said period of six days will be filed and noted in the order of their receipt. Any applications not based on a prior settlement right will be subject to valid settlement claims asserted in the manner required by law.

3. Simultaneous filings for public lands.—Applications reaching said local land office during said period of six days will be held and treated as simultaneously filed, and the register and receiver will dispose of them as follows:

- (a) Where there is no conflict, the application will be allowed.
- (b) Where there are conflicting homestead applications, the register and receiver will write on cards the names of the several applicants, and each of these cards will be placed in an envelope upon which there is no distinctive or identifying mark, and at 2 o'clock p. m., on the date of opening to entry, if practicable (if not, at the same hour one day later), after all the envelopes containing the names of the several applicants shall have been thoroughly mixed in the presence of such persons as may desire to be present, they will be drawn and numbered in order. The cards as drawn and numbered will be securely fastened to the applications of the respective persons, and the applications will be allowed in such order. Applications conflicting in whole with those previously allowed will be rejected in the usual manner.

4. Failure of applicant to obtain public land applied for.—Where any applicant fails to obtain land applied for by him, he will be permitted to elect whether he will amend his application to embrace other lands not affected by pending applications and otherwise subject thereto when such amended application is presented, or withdraw his original application without prejudice. In the event of such withdrawal the fees and commissions will be returned by the receiver, and the water-rental charges deposited will be returned by the project manager, upon surrender of the certificate of filing issued by the project manager.

5. Warning against unlawful settlement upon public land.—No person will be permitted to gain or exercise any right whatever under any settlement or occupation of any of said public lands, begun at or prior to 9 a. m. April 25, 1919; provided, however, that this shall not affect any valid existing right obtained by settlement or entry while the land was subject thereto.

6. Limit of area for which entry may be made.—The limit of area per entry representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such lands, is fixed as shown upon the plats for the several farm units.

7. Application for water rental.—All water-rental applications must be made to the project manager, United States Reclamation

Service, Montrose, Colo. Applications may be made on or after the date hereof upon forms provided for that purpose and must be accompanied by a payment of \$3 per acre for each irrigable acre contained in the farm unit. Each water-rental application must be for a specified farm unit, and more than one person may make such application for the same farm unit. A certificate of filing will be issued each applicant by the project manager. Filing of water-rental application and issuance of certificate give no preference right to entry on public lands. Only when the project manager is notified by the local land office that an entry has been allowed will acceptance of the water-rental application be indorsed thereon. Whereupon all other water-rental applications affecting the farm unit in question with payments made will be returned to the respective applicants, upon surrender by them of the certificate of filing issued by the project manager.

8. **Water-rental charge.**—The initial payment of \$3 per irrigable acre will be credited as payment of a minimum charge of \$1 per acre for each of three successive years beginning with the year in which entry is made, payment of which amount will entitle the entryman to \$1 worth of water each of said years, at the rates fixed in the regulations of the Secretary of the Interior for similar lands on the project; provided that when lands have been, or hereafter are entered after June 15 of any year, and therefore do not secure the benefits of water for irrigation purposes in that year, the payment of the \$3, made at the time of entry, will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges for the three-year period beginning with the year following that in which entry is made, in accordance with the minimum charges which have been or hereafter may be established by the Secretary of the Interior for similar lands on the project. Additional water will be furnished at the same rate as established for water deliveries to other lands in the project. The charges herein provided will be made against each acre of irrigable land in the farm unit whether water is used thereon or not, and no part of the initial payment of \$3 per irrigable acre will be refunded at the termination of the three-year period. Future charges will be announced by further order or by public notice. Said minimum water-rental charge of \$3 per irrigable acre will be required to be deposited in advance by the prospective entryman upon executing water-rental application before making application for entry in accordance with the terms of this order.

9. **Water users' association.**—The successful applicant after making homestead application will be required to subscribe the land embraced in his farm unit to the Uncompahgre Valley Water Users' Association.

10. **Water-right application under public notice.**—Within three months after date of public notice, hereafter to be issued for the lands described in said farm-unit plats, each entryman must make a formal water-right application covering his farm unit, in accordance with the terms of such notice and the last proviso of section 1 of said reclamation extension act. Upon failure so to do, the Secretary of the Interior may, at his option, cancel the entry in question with all rights acquired thereunder.

S. G. HOPKINS,
Assistant Secretary of the Interior.

ORDER, APRIL 9, 1919.

1. **Public lands for which entry may be made and water is available.**—In pursuance of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly sections 1, 10 and 11 of the reclamation extension act of August 13, 1914 (38 Stat., 686), it is announced that water is available, as hereinafter specified, and entry may be made in accordance with the terms and conditions imposed by this notice on the following described farm units:

Farm unit.	Description.	Acres irrigable.
N.....	W. $\frac{1}{4}$ NW. $\frac{1}{4}$, SE. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ W. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ NE. SW. $\frac{1}{4}$, E. $\frac{1}{4}$ W. $\frac{1}{4}$ NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 29, T. 15 S., R. 96 W., sixth P. M.	56
P.....	W. $\frac{1}{4}$ SE. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ W. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 29, T. 15 S., R. 96 W., sixth P. M.	49
Q.....	E. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 29; SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 28, T. 15 S., R. 96 W., sixth P. M.	48

A diagram showing the above described farm units, which is amendatory of a township plat approved February 20, 1918, was approved by the department on the date of this order, and is on file in the office of the project manager, United States Reclamation Service, Montrose, Colo., and at the local land office, Montrose, Colo.

2. **Special conditions of opening and allowance of entry.**—The opening of the farm units and the allowance of entry thereon under this notice is upon the express condition that the entryman shall take the water available for the farm unit entered by him at a point known as station 244 + 55 on the Buttermilk lateral, located in the NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 33, T. 15 S., R. 96 W., sixth principal meridian, approximately 470 feet west and 125 feet south of the north quarter corner of said section 33, and at his own sole cost and expense construct, operate and maintain a siphon and other irrigation works necessary for carrying the water from said point of delivery to his entry. A further condition of the allowance of entry is that the applicant shall within one year from the date of his entry construct the siphon and other irrigation works necessary for carrying the water from said point of delivery to his entry and upon failure so to do within said year, the Secretary of the Interior may at his option cancel his entry with all rights acquired thereunder. Nothing herein is to be construed, however, as preventing an entryman from joining with other entrymen for the purpose of jointly constructing the necessary irrigation works for carrying the water from said point at which it is delivered by the United States to the lands of the entrymen.

3. **When and how to make entry for public land.**—Homestead entries for the farm units shown on said plats may be made beginning May 2, 1919, at 9 o'clock a. m., at the said local land office. Every person desiring to acquire any of said public lands must execute a homestead application subject to the provisions of the reclamation law in manner required by law, which, with the required fees and commissions, accompanied by certificate of the project manager as to the filing of application for rental of water and payment of water-rental charges as hereinafter provided, may be presented to said

local land office, in person, by mail, or otherwise, within a period of six days prior to the opening, to wit: On and from April 26, 1919, to and including 9 o'clock a. m., May 2, 1919. Applications presented after said period of six days will be filed and noted in the order of their receipt. Any applications not based on a prior settlement right will be subject to valid settlement claims asserted in the manner required by law.

4. **Simultaneous filings for public lands.**—Applications reaching said local land office during said period of six days will be held and treated as simultaneously filed, and the register and receiver will dispose of them as follows:

(a) Where there is no conflict the application will be allowed.

(b) Where there are conflicting homestead applications the register and receiver will write on cards the names of the several applicants, and each of these cards will be placed in an envelope upon which there is no distinctive or identifying mark, and at 2 o'clock p. m., on the date of opening to entry, if practicable (if not, at the same hour one day later), after all the envelopes containing the names of the several applicants shall have been thoroughly mixed, in the presence of such persons as may desire to be present, they will be drawn and numbered in order. The cards as drawn and numbered will be securely fastened to the applications of the respective persons, and the applications will be allowed in such order. Applications conflicting in whole with those previously allowed will be rejected in the usual manner.

5. **Failure of applicant to obtain public land applied for.**—Where any applicant fails to obtain land applied for by him he will be permitted to withdraw his original application without prejudice. In the event of such withdrawal the fees and commissions will be returned by the receiver, and the water-rental charges deposited will be returned by the project manager, upon surrender of the certificates of filing issued by the project manager.

6. **Warning against unlawful settlement upon public land.**—No person will be permitted to gain or exercise any right whatever under any settlement or occupation of any of said public lands, begun at or prior to 9 a. m. May 2, 1919: *Provided, however,* That this shall not affect any valid existing right obtained by settlement or entry while the land was subject thereto.

7. **Limit of area for which entry may be made.**—The limit of area per entry representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such lands, is fixed as shown upon the plats for the several farm units.

8. **Application for water rental.**—All water-rental applications must be made to the project manager, United States Reclamation Service, Montrose, Colo. Applications may be made on or after the date hereof upon forms provided for that purpose and must be accompanied by a payment of \$3 per acre for each irrigable acre contained in the farm unit. Each water-rental application must be for a specified farm unit, and more than one person may make such application for the same farm unit. A certificate of filing will be issued each applicant by the project manager. Filing of water-rental application and issuance of certificate give no preference right to entry on public lands. Only when the project manager is notified

by the local land office that an entry has been allowed will acceptance of the water-rental application be indorsed thereon. Whereupon all other water-rental applications affecting the farm unit in question with payments made, will be returned to the respective applicants, upon surrender by them of the certificates of filing issued by the project manager.

9. **Water-rental charge.**—The initial payment of \$3 per irrigable acre will be credited as payment of a minimum charge of \$1 per acre for each of three successive years beginning with the year in which entry is made, payment of which amount will entitle the entryman to one dollar's worth of water each of said years, at the rates fixed in the regulations of the Secretary of the Interior for similar lands on the project: *Provided*, That when lands have been or hereafter are entered after June 15 of any year, and therefore do not secure the benefits of water for irrigation purposes in that year, the payment of the \$3, made at the time of entry, will be applied as a credit to the minimum water-rental charges, or the minimum operation and maintenance charges for the three-year period beginning with the year following that in which entry was made, in accordance with the minimum charges which have been or hereafter may be established by the Secretary of the Interior for similar lands on the project. Additional water will be furnished at the same rate as established for water deliveries to other lands in the project. The charges herein provided will be made against each acre of irrigable land in the farm unit whether water is used thereon or not and no part of the initial payment of \$3 per irrigable acre will be refunded at the termination of the three-year period. Future charges will be announced by further order or by public notice. Said minimum water-rental charge of \$3 per irrigable acre will be required to be deposited in advance by the prospective entryman upon executing water-rental application before making application for entry in accordance with the terms of this order.

10. **Water users' association.**—The successful applicant after making homestead application will be required to subscribe the land embraced in his farm unit to the Uncompahgre Valley Water Users' Association.

11. **Water-right application under public notice.**—Within three months after date of public notice hereafter to be issued, for the lands described in said farm unit plat, each entryman must make a formal water-right application covering his farm unit in accordance with the terms of this order and such notice and the last proviso of section 1 of said reclamation extension act. Upon failure so to do, the Secretary of the Interior may at his option cancel the entry in question with all rights acquired thereunder.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Uncompahgre project, June 30, 1919.

Cash.....		\$4,259.96
Inventory of material and supplies on hand.....		33,500.72
Accounts receivable.....		210.00
Construction work contracted (value of outstanding ditch systems).....		68,562.68
Construction work:		
Gross construction cost.....	\$6,357,305.81	
Gross operation and maintenance during construction.....	972,495.31	
Plant accounts.....	11,850.52	
		\$7,341,651.64
Less construction revenue earnings.....		767,137.39
Net construction cost.....		6,574,514.25
Accounts payable.....		48,836.90
Contingent obligations.....		72,822.66
Capital investment:		
Disbursement and transfer vouchers received.....	7,500,573.50	
Less collection and transfer vouchers issued.....	941,186.43	
Net investment.....		6,559,388.07

Feature costs of Uncompahgre project, June 30, 1919.

	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....		\$96,541.76
Storage investigations (Taylor Park Dam).....		12,698.92
Canal system:		
Gunnison River weir and headworks.....	\$5,398.67	121,233.37
Gunnison Tunnel.....	35,174.05	3,084,829.68
South Canal.....	662.73	871,308.20
	41,235.45	4,077,371.25
Lateral system:		
South.....	5,455.27	60,088.88
West.....	264.98	271,611.11
Montrose & Delta.....	4,405.66	561,633.99
Loutsenhizer.....	279.78	137,793.25
Selig.....	2,053.14	351,312.95
Ironstone.....	24,715.82	445,651.32
East.....	1,281.66	264,926.54
Garret.....	172.27	5,554.20
Preliminary estimates sublaterals.....	152.28	152.28
	38,780.86	2,098,724.52
Drainage investigations.....	109.89	3,940.63
Power system—preliminary work.....		273.85
Farm units.....	235.93	36,093.20
Permanent improvements:		
Lands and buildings.....	2,785.89	24,873.20
Roads.....	137,735.00	
	\$34,949.11	24,873.20
Telephone system.....		6,788.48
Operation and maintenance during construction (water rental basis).....	133,451.92	972,495.31
Subtotal.....	178,863.94	7,329,801.12
Plant accounts.....		11,850.52
Gross construction cost.....	178,863.94	7,341,651.64
Less revenues earned during construction period:		
Rentals of buildings.....	675.63	20,157.21
Rentals of grazing and farming lands.....	25.00	32.00
Rentals of irrigation water.....	155,510.97	741,376.38
Contractor's freight refunds.....	7.81	2,679.47
Other revenues, unclassified.....		24.00
Profits on hospital operations.....	\$1,806.45	2,868.32
	154,412.96	767,137.39
Net construction cost to June 30, 1919.....	24,450.98	6,574,514.25

¹ Deduct; transferred to Gunnison Tunnel costs.

² Deduct.

Cost statement by calendar years, Uncompahgre project.

	Construction.	Operation and maintenance during construction.	Total cost.
1904 (includes 1902 to 1904).....	\$66,068.02	.....	\$66,068.02
Year ending Dec. 31—			
1905.....	623,904.17	.....	623,904.17
1906.....	1,199,879.82	.....	1,199,879.82
1907.....	904,910.39	.....	904,910.39
1908.....	541,230.15	\$7,723.63	548,953.78
1909.....	594,384.50	21,331.50	615,716.00
1910.....	414,994.51	45,621.97	460,616.48
1911.....	274,704.21	47,156.30	321,860.51
1912.....	279,080.25	71,197.61	350,277.86
1913.....	267,755.55	104,523.62	372,279.17
1914.....	295,499.72	71,089.73	366,589.45
1915.....	301,819.68	89,569.33	391,389.01
1916.....	283,855.19	89,997.26	373,852.45
1917.....	190,204.77	165,083.88	325,288.65
1918.....	134,498.09	195,293.84	329,791.93
Jan. 1 to June 30, 1919.....	14,546.79	63,906.64	78,453.43
Subtotal.....	6,357,305.81	972,495.31	7,329,801.12
Plant accounts on June 30, 1919.....	.....	11,850.52	11,850.52
Total.....	6,357,305.81	984,345.83	7,341,651.64

Cost statement by fiscal years, Uncompahgre project.

	Construction.	Operation and maintenance during construction.	Total cost.
1905 (includes 1902 to 1905).....	\$131,304.58	.....	\$131,304.58
Year ending June 30—			
1906.....	1,130,248.77	.....	1,130,248.77
1907.....	1,118,883.07	.....	1,118,883.07
1908.....	610,901.02	\$1,740.71	612,641.73
1909.....	664,653.48	17,504.38	682,157.86
1910.....	567,272.09	21,148.27	588,420.36
1911.....	253,221.37	59,874.71	313,096.08
1912.....	907,552.80	62,056.19	969,608.99
1913.....	197,088.86	83,920.94	281,009.80
1914.....	294,128.54	87,955.42	382,083.96
1915.....	383,917.56	72,820.40	456,737.96
1916.....	\$10,332.20	96,836.07	409,219.27
1917.....	190,996.08	113,099.66	304,095.74
1918.....	147,393.37	220,394.64	367,788.01
1919.....	45,412.02	133,451.92	178,863.94
Subtotal.....	6,357,305.81	972,495.31	7,329,801.12
Plant accounts to June 30, 1919.....	.....	11,850.52	11,850.52
Total.....	6,357,305.81	984,345.83	7,341,651.64

Estimated cost of contemplated work, Uncompahgre project, during fiscal year 1920.

Principal features.	Estimated cost during fiscal year 1920.
Lateral system: Excavation and minor structures.....	\$13,000
Drainage system: Surveys.....	400
Farm units.....	100
Permanent improvements.....	1,000
Operation and maintenance, water rentals.....	135,000
Reimbursable accounts.....	500
Total.....	150,000

IDAHO, BOISE PROJECT.

J. B. BOND, project manager, Boise, Idaho.

LOCATION.

Counties: Ada, Boise, Canyon, Elmore, and Malheur.

Townships: 1 S. to 5 N., Rs. 6 W. to 6 E., Boise meridian, and Tps. 21 and 22 S., R. 46 E., Willamette meridian.

Railroads: Oregon Short Line; Boise, Nampa & Owyhee and Idaho Northern (now branches of Oregon Short Line); Boise Valley Traction; Caldwell Traction; and Intermountain.

Railroad stations and estimated population June 30, 1919: Boise, 26,500; Nampa, 5,750; Caldwell, 5,500; Meridian, 1,000; Kuna, 400; Wilder, 600; Bowmont, 50; and Melba, 200.

WATER SUPPLY.

Source of water supply: Boise River.

Area of drainage basin: 2,610 square miles.

Annual run-off in acre-feet of Boise River near Highland (2,610 square miles), 1895 to 1918: Maximum, 3,829,800; minimum, 1,119,530; mean, 2,550,650.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 274,021 acres, including 130,440 acres of vested water-right lands.

Area under water-right applications and rental contracts season of 1919: 142,758 acres.

Area under special contracts: 130,440 acres.

Length of irrigation season: April 5 to October 5, 181 days.

Average elevation of irrigable area: 2,500 feet above sea level.

Rainfall on irrigable area: At Boise station for 50 years, average 13.81 inches; 1918, 12.73 inches.

Range of temperature on irrigable area: 28° to 111° F.

Character of soil of irrigable area: Clayey loam, light sandy loam, and sandy loam.

Principal products: Alfalfa, wheat, oats, clover, potatoes, apples, prunes, and small fruits.

Principal markets: Boise, Nampa, Caldwell, and Meridian, Idaho; Portland, Oreg.; and eastern cities.

LANDS OPENED FOR IRRIGATION.

Dates of public notices: July 2, 1917; April 1, 1918; March 7, 1919; March 8, 1919.

Limit of area of farm units: Public, 80 acres; private, 160 acres.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1902.

Construction recommended by board of engineers February 15, 1905.

Construction authorized by Secretary March 27, 1905.

Main canals of New York Canal Co. and Idaho-Iowa Lateral & Reservoir Co. acquired March 3, 1906.

First irrigation by Reclamation Service, season of 1906.

Boise River Dam completed September, 1908.

Upper Deer Flat embankment completed March, 1911.

Deer Flat forest embankment completed June, 1911.

Lower Deer Flat embankment completed January, 1912.

Boise River power plant completed May, 1912.

Arrowrock Dam completed November, 1915.

Pioneer district drainage completed June, 1916.

Nampa and Meridian district drainage completed August, 1917.

Project 99 per cent completed June 30, 1919 (not including extensions).

IRRIGATION PLAN.

The irrigation plan of the Boise project provides for storage of water in the Arrow-rock Reservoir on Boise River, about 22 miles above Boise, and in the Deer Flat Reservoir near Caldwell and Nampa, Idaho; the diversion of water from Boise River by the Boise River Dam, about 8 miles above Boise; the distribution of water on the south side of Boise River, through the Main Canal, leading from the dam to the Deer Flat Reservoir; distributing laterals heading in the Main Canal; distributing canals heading in the Deer Flat Reservoir; and distributing canal systems heading in the Boise River below the Boise River Dam; and the distribution of water on the north side of the Boise River to a small area of land east of Boise through a canal system heading in the Boise River Dam. The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

SUMMARY OF GENERAL DATA FOR BOISE PROJECT TO END OF FISCAL YEAR 1919.**Areas:**

Irrigable acreage when completed, including possible extensions.	327, 552
Public land entered to end of fiscal year	67, 452
Public land withdrawn at end of fiscal year	3, 160
State land unsold June 30, 1918	1, 859
Private land	255, 791
Acreage service could have supplied season of 1918	274, 339
Estimated acreage service can supply July 1, 1920	274, 021
Acreage irrigated, season of 1918 exclusive of vested right lands . .	110, 000
Acreage irrigated, 1918, covered by crop census	95, 074
Acreage cropped, season of 1918, covered by crop census	90, 720

Crops:

Value of irrigated crops, season of 1918, covered by crop census . .	\$5, 154, 646. 00
Value of irrigated crops, per acre cropped, covered by crop census . .	56. 80

Finances:

Net construction cost to end of fiscal year	\$11, 973, 276. 17
Per cent complete at end of fiscal year (except extensions)	99. 0
Appropriation for fiscal year 1920, total	\$664, 000. 00
Allotment for construction, fiscal year 1920	\$214, 000. 00
Estimated per cent complete, June 30, 1920 (except extensions) . .	100. 0
Proposed appropriation, fiscal year 1921	\$774, 000. 00
Estimated per cent complete, June 30, 1921 (except extensions) . .	100. 0
Announced construction charges per acre	\$70 and \$80
Appropriation, fiscal year 1919 (direct)	\$732, 000. 00
Miscellaneous collections and transfers	62, 004. 03
Increased compensation	24, 089. 24

818, 093. 27

Expenditures during fiscal year, chargeable to 1919 appropriation:

Disbursements	\$464, 553. 28
Transfers	40, 041. 14
Registered liabilities chargeable to 1919 appropriation	42, 263. 54
Contract obligations wholly covered by 1919 appropriation	11, 822. 08

558, 680. 04

Unencumbered balance, July 1, 1919	259, 413. 23
--	--------------

Repayments:	
Value of construction water-right contracts.....	\$11,760,427.46
Construction charges:	
Accrued to end of fiscal year.....	502,848.63
Collected at end of fiscal year.....	455,730.51
Uncollected at end of fiscal year.....	47,118.12
Operation and maintenance charges:	
Accrued to end of fiscal year.....	208,827.54
Collected to end of fiscal year.....	171,669.28
Uncollected at end of fiscal year.....	37,158.26
Water rental charges:	
Accrued to end of fiscal year.....	677,654.83
Collected to end of fiscal year.....	671,427.10
Uncollected at end of fiscal year.....	6,227.73
Power earnings:	
Accrued to end of fiscal year.....	82,794.56
Collected to end of fiscal year.....	82,794.56
Drainage:	
Estimated acreage damaged by seepage at end of fiscal year.....	6,650
Miles of drains built to end of fiscal year —	
Open.....	149.5
Closed.....	.4
Total.....	149.9
Estimated acreage protected by drains built to end of fiscal year...	88,000
Estimated acreage to be protected by authorized system.....	93,500
Cost of drainage works to end of fiscal year.....	\$776,754.44

CONSTRUCTION DURING FISCAL YEAR.

Distribution unit.—Considerable construction work was completed in connection with this feature during the fiscal year 1919. Seven hundred and ten structures were installed which required the placing of 1,835 cubic yards of concrete, 574 cubic yards of masonry, and 133,700 feet of lumber. The lining work on the Main South Side Canal was of the most importance and comprised the placing of 1,600 cubic yards of concrete. No work of consequence is now in progress.

Notus Canal unit.—Construction of this unit commenced in March and at the present date 44 structures have been completed. One of the most important structures constructed was a 5½-foot diameter siphon, 272 feet in length. The pipe was built in place. Materials placed in the construction of the completed structure amounted to 280 cubic yards of concrete and 110,000 feet of lumber. The earth-work on the portion of the Notus Canal above the Boise River was contracted for, and on June 30, 1919, was practically complete. The yardage moved amounted to 140,881 yards of class 1, 16,649 yards of class 2, and 8,606 yards of class 3. Work in progress consists of clearing of right of way for the construction of the Boise River siphon and several other miscellaneous structures.

Riverside drainage.—This feature was commenced during the early part of the fiscal year 1919. Satisfactory progress has been made and includes the complete installation of 241 structures and the excavation of approximately 700,000 cubic yards of material. In the con-

struction of the structures 280 cubic yards of concrete and 250,000 feet of lumber were placed. Bucyrus electric draglines were used on the excavation of all drains. Work in progress is along the same lines as reported above.

BOISE POWER PLANT.

As the hydroelectric plant at Boise diversion dam had served its principal purpose for the construction of Arrowrock Dam, it was leased to the Idaho Power Co. for a period of five years, beginning July 1, 1916, for an annual rental of \$11,000. All costs of operation and maintenance are borne by the lessee, and reservation of electric power is held at cost of production for use in drainage and other work on the project.

SEEPAGE AND DRAINAGE.

The approximate area of seeped land is given in the accompanying table, based on a water plane from zero to 6 feet below the ground surface. These areas are not wholly unproductive, but the tendency is for conditions to gradually grow worse. There is one area in the Nampa and Meridian irrigation district which is quite bad and growing worse each year.

Name of area.	Acreage reclaimed.	Estimated acreage still seeped.
Pioneer irrigation district.....	10, 200	300
Nampa and Meridian irrigation district.....	5, 850	350
Fargo Basin.....	700	600
Arena Basin.....		500
Ten Mile.....		500
Greenleaf.....		350
Frohman.....		150
Riverside and Big Bend irrigation district.....	2, 500	3, 000
Miscellaneous.....		700
Total.....	19, 250	6, 650

Pursuant to the contract with the Riverside irrigation district, construction of the drainage system in that district has been under process for the past fiscal year. Two hundred and forty-one miscellaneous structures have been installed, involving the use of 249,779 b. m. feet of lumber and 72 barrels of cement. Excavation amounted to 700,211 cubic yards, by two Bucyrus electric dredges.

OPERATION AND MAINTENANCE.

During 1918 water was delivered on the basis set forth in paragraph 10 of the public notice issued July 2, 1917, i. e., at the rate of 75 cents for the first acre-foot, 20 cents per acre-foot for additional water during the flood season ending June 30, and 40 cents per acre-foot during the storage season—beginning July 1. The revenues from this source amounted to approximately \$230,000 and resulted in a delivery of 492,816 acre-feet of water to 2,207 farms, containing an irrigable area of 117,024 acres. The average amount of water used

was 3.75 acre-feet, at an average cost of \$2.67 per acre for operation and maintenance. On April 1, 1918, public notice No. 2 was issued. This notice announced the beginning of construction charge on 507.59 acres of private land contiguous to the Nampa and Meridian irrigation district.

The reservoirs of the Idaho-Iowa Lateral & Reservoir Co. were partly filled, under contract, through the Government canal system.

Under permanent contracts water was released from Arrowrock Reservoir to supplement the vested rights of the following irrigation districts: Nampa and Meridian, Pioneer, Farmer's Cooperative Ditch Co., Settler's Canal Co., the Farmer's Union Ditch Co., and the New York Canal Co.

The rights of the United States to divert water from the natural flow of the Boise River terminated for the season of 1918 on July 13, after which it was necessary to draw from Arrowrock Reservoir to maintain the necessary discharge in the Main Canal.

The full storage capacity of Arrowrock Reservoir was available for the season; the maximum storage was reached on June 14, 1918. On October 4 the water had all been drawn out except 21,252 acre-feet. The maximum storage for Deer Flat Reservoir was 162,585 acre-feet, which was reached on April 18, 1918. On October 12 there remained 23,146 acre-feet in this reservoir.

The total diversion for the project during 1918 was 824,458 acre-feet, or 6.27 acre-feet per acre, which included canal and reservoir losses. The total waste from the project was 5.17 per cent of the total diverted at the head of the Main Canal. The loss from the Deer Flat Reservoir was 16 per cent, as compared with 12.6 per cent for 1917.

Maintenance.—The fall of 1918 was even more favorable than that of 1917 for maintenance work, as freezing weather did not interfere with construction repairs until the latter part of December. The canal and lateral systems of the project were put in good condition. The winter of 1918 and 1919 was exceptionally mild, resulting in little damage to canals and structures. The spring of 1919 was exceptionally dry and most of the canals and laterals were run at capacity shortly after the opening of the irrigation season, or April 5. Notwithstanding this very few breaks occurred, and these few were on the lower end of the project.

Historical review, Boise project, Idaho.

Item.	1914	1915	1916	1917	1918	1919
Acreage to which service was prepared to furnish water.....	207,000	207,000	¹ 223,896	¹ 223,896	¹ 274,339	¹ 274,021
Acreage irrigated.....	83,590	97,127	² 101,315	² 95,524	110,000	(³)
Miles of canals operated.....	971	973	980	982	988	980
Water diverted (acre-feet).....	496,665	542,102	656,854	618,272	824,462	(³)
Water delivered to land per acre of land irrigated (acre-feet).....	2.62	2.81	3.56	3.07	3.75	(³)

¹ Including partial service to vested water-right lands.

² Acreage served with full water supply.

³ Not yet determined.

SETTLEMENT.

Throughout the past fiscal year there has been a great influx of people into the Boise Valley. All hotels in the various towns on the project have been crowded to capacity. Farm lands have been in demand at prices ranging from \$100 to \$350 per acre. Hundreds of farms have changed hands several times. This movement of farm property has been accompanied by an era of building both in the surrounding towns and on the farms. The excellent prices received from the sale of farm products assure the continuation of the present good times and the future settlement of the Boise project.

Settlement data, Boise project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project.....	2,660	3,926	3,932	3,992	3,992
Population.....	8,600	12,560	12,590	13,200	15,000
Number of irrigated farms.....	1,908	2,450	2,780	3,960	3,207
Operated by owners or managers.....	1,358	1,590	1,900	2,090	2,515
Operated by tenants.....	550	860	880	970	662
Population.....	6,143	7,520	8,340	9,170	10,000
Number of towns.....	10	10	10	10	10
Population.....	30,500	34,350	34,750	36,000	40,000
Total population in towns and on farms..	39,100	46,910	47,330	49,200	55,000
Number of public schools.....	22	22	22	24	24
Number of churches.....	52	52	52	52	54
Number of banks.....	13	15	15	15	15
Total of capital stock.....	\$1,545,900	\$1,750,000	\$1,800,000	\$1,800,000	\$2,000,000
Amount of deposits.....	\$8,424,300	\$9,000,000	\$11,500,000	\$11,500,000	\$13,500,000
Number of depositors.....	1 23,777	1 24,850	1 25,000	1 25,000	1 28,000
Total number of relinquishments.....	6	18	32		3

1 Estimated; some banks refuse to give number of depositors.

PRINCIPAL CROPS.

The principal crops grown on the project during 1918, according to value, were as follows: Alfalfa, wheat, potatoes, clover hay, and clover seed. Alfalfa covered the largest area, amounting to 37,507 acres, showing an increase over the previous year of 3,420 acres. The fruit crop on the project was small owing to the late frost. Market conditions were excellent, but some losses occurred on account of shipping facilities. The average crop return was increased from \$49.77 in 1917 to \$56.80 in 1918. All these figures are restricted to the areas covered by the usual crop census of the Reclamation Service and do not include lands in the New York Canal tract nor in the Nampa and Meridian and Pioneer irrigation districts, to which the Government furnished water to supplement partial vested rights.

Crop report, Boise project, Idaho, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	37,507	Ton.....	163,469	4.4	\$14.00	\$2,287,857	\$61.00
Alfalfa seed.....	429	Bushel.....	1,590	3.7	12.79	20,337	47.41
Alsike hay.....	26	Ton.....	40	1.52	10.00	400	15.38
Alsike seed.....	233	Bushel.....	463		17.67	8,180	35.11
Apples.....	1,570	Pound.....	1,413,404	900	.03	40,947	26.08
Barley.....	2,358	Bushel.....	57,495	24.4	1.52	87,489	37.10
Beans.....	812	do.....	20,595	25.4	3.23	66,529	81.93
Beets.....	2	Ton.....	20	10	10.00	200	100.00
Cane.....	5	do.....	16	2.9	12.75	204	37.09
Clover hay.....	5,709	do.....	10,807	1.9	12.11	130,821	22.91
Clover seed.....	4,569	Bushel.....	17,652	3.9	17.13	302,507	66.21
Corn, Indian.....	2,491	do.....	98,482	39	2.28	224,245	90.92
Corn, sorghum.....	17	do.....	317	17	1.65	524	30.82
Corn, ensilage.....	146	Ton.....	1,345	9	9.82	13,214	90.51
Corn, fodder.....	477	do.....	2,906	6	6.11	17,763	37.24
Corn, pop.....	96	Bushel.....	4,180	43	1.81	7,585	79.01
Fruits, small.....	109	Pound.....	137,059	1,257	.06	7,853	72.06
Garden.....	572					44,350	77.53
Hay, miscellaneous.....	209	Ton.....	374	1.8	11.45	4,282	20.49
Millet seed.....	35	Bushel.....	472	13	4.84	2,286	66.31
Oats.....	2,110	do.....	56,567	27	1.03	53,136	27.55
Onions.....	21	do.....	2,228	106	1.26	2,824	134.48
Pasture.....	5,345					103,503	19.36
Peaches.....	149	Pound.....	127,768	857	.04	5,587	37.60
Pears.....	12	do.....	3,042	262	.10	312	27.13
Prunes.....	302	do.....	92,296	305	.05	4,565	15.12
Potatoes, white.....	1,843	Bushel.....	331,663	180	1.10	363,298	197.12
Potatoes, sweet.....	22	do.....	304	14	3.58	1,087	49.41
Rye.....	127	do.....	904	7	1.87	1,691	13.32
Wheat.....	30,071	do.....	722,450	24	1.86	1,346,070	44.76
Less duplicated areas.....	6,654						
Total cropped acreage.....	90,720	Total and average.....				5,154,646	56.80

Areas.		Acres.		Farms.	Per cent of project.
Irrigated, no crop:					
Nonbearing orchard.....	507	Total irrigable area farms reported.....	115,480	2,207	80.3
Young alfalfa.....	7,014	Total irrigated area farms reported.....	95,074	2,207	66.1
Young clover.....	584	Under water-right applications.....	89,774		62.4
Miscellaneous.....	616	Under rental contracts.....	5,300		3.7
Ground fall plowed.....	2,281	Total cropped area farms reported.....	90,720	2,207	63.0
Less duplicated areas.....	6,648				
Total irrigated area.....	95,074				

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, MARCH 7, 1919.

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), public notice for the Boise project, Idaho-Oregon, is hereby issued as follows:

2. Lands for which water will be furnished.—Upon proper water-right application being made therefor, water will be furnished under said project in the irrigation season of 1919 and thereafter for the irrigable lands of said project, shown on the farm-unit plats of the following townships, to wit:

BOISE MERIDIAN.

T. 4 N., R. 5 W.: Sec. 4, E. $\frac{1}{2}$ SW. $\frac{1}{2}$; sec. 5, NE. $\frac{1}{2}$; sec. 9, NE. $\frac{1}{2}$ NW. $\frac{1}{2}$.
 T. 5 N., R. 5 W.: Sec. 29, W. $\frac{1}{2}$; sec. 30, S. $\frac{1}{2}$ NE. $\frac{1}{2}$ and N. $\frac{1}{2}$ SE. $\frac{1}{2}$; sec. 32,
 E. $\frac{1}{2}$ NW. $\frac{1}{2}$.

WILLAMETTE MERIDIAN.

T. 21 S., R. 46 E.
 T. 21 S., R. 47 E.
 T. 22 S., R. 46 E.

Said plats were approved by the Secretary of the Interior on January 26, 1917, and are on file at the local land office at Boise, Idaho, and at the office of the project manager, United States Reclamation Service, Boise, Idaho.

3. **Public notice of July 2, 1917, applicable.**—All of the terms and conditions of the public notice for the Boise project, dated July 2, 1917, so far as the same may be applicable, shall apply to the lands covered by this public notice and shown on the farm-unit plats above described.

4. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice shall be the same as that for other lands of the Boise project under public notice.

5. **Limitation as to reduced construction charge.**—The time within which a reduced construction charge may be secured under paragraph 9 and subdivision (c) of paragraph 11 of said public notice, dated July 2, 1917, is not extended as to any land beyond July 2, 1918.

S. G. HOPKINS,

Assistant Secretary of the Interior.

PUBLIC NOTICE, MARCH 8, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charge for the irrigation season of 1919, and thereafter until further notice, against all lands of the Boise project, Idaho-Oregon, under public notice, shall be a minimum charge of \$1.25 per irrigable acre, whether water is used thereon or not, which will entitle the water user to 2 acre-feet of water, measured on the land; further water will be furnished at the rate of 30 cents per acre-foot during the flood season ending June 30 and 60 cents per acre-foot during the storage season beginning July 1: *Provided*, That the owners of New York water-right lands who are under contract with the United States for storage water shall pay 65 cents per irrigable acre, whether water is used thereon or not, which will entitle the user to 1 acre-foot of water per irrigable acre after July 1, and additional water will be delivered at the rate of 60 cents per acre-foot: *Provided further*, That in case stock and domestic water is delivered outside of the irrigation season a charge of \$2 per acre-foot will be made for the same, with a minimum charge of \$2 to each applicant for such service. All operation and maintenance charges will be due and payable on March 1, following the irrigation season; but

where water-right application is made for land in private ownership after August 1 no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Boise project, June 30, 1919.

Cash.....		\$17,005.42
Inventory of materials and supplies on hand.....		65,743.06
Accounts receivable:		
Current accounts due.....	\$91,012.77	
Construction water-right charges unaccrued.....	11,282,610.83	
		11,373,623.60
Construction work contracted.....		11,822.08
Gross construction cost.....	\$12,758,215.87	
Less construction revenue earnings.....	784,939.70	
Net construction cost.....		11,973,276.17
Gross operation and maintenance cost.....	428,282.46	
Less operation and maintenance revenue earnings.....	39,597.71	
		388,684.75
Accounts payable.....		57,361.06
Contingent obligations.....		28,827.50
Collections and contracts of specific amounts for repayments to reclamation fund.....		12,011,334.50
Capital investment:		
Disbursement, transfer, and joint construction vouchers received.....	\$13,847,942.19	
Collection, transfer, refund, and joint construction vouchers issued.....	2,065,310.26	
Net investment.....		11,752,631.93

Feature costs of Boise project to June 30, 1919.

Feature.	Fiscal year 1919.	To June 30, 1919.
Examination and surveys:		
Distribution unit.....	\$68.69	\$124,245.63
Storage unit.....		8,720.61
	86.69	132,966.24
Storage system:		
Deer Flat Reservoir—		
Location and surveys.....		4,881.13
Right of way.....		234,533.74
Upper embankment.....		343,892.07
Lower embankment.....		354,645.82
Forest embankment.....		6,206.06
Equalizing channels.....		5,729.32
Clearing site, etc.....		7,686.16
Arrowrock Reservoir—		
Preliminary and general work.....		177,172.37
Right of way.....		70,570.86
Water rights.....		20,041.78
Arrowrock Dam.....	13,358.40	3,611,048.51
Log conveyor.....		54,215.66
Crane.....		9,344.98
Power preparatory.....		19,451.36
Spillway.....	480.40	531,136.51
Bridge over spillway.....		3,749.04
	12,878.00	5,454,345.37
Canal system:		
Main South Side Canal.....	28,009.30	2,063,839.31
Notus Canal (north side).....	121,523.44	121,523.44
	149,532.74	2,185,362.75
Lateral system:		
From Main Canal.....	20,176.18	1,441,794.45
From Deer Flat Reservoir.....	593.40	1,174,206.99
Penitentiary lateral.....		24,355.93
	20,769.58	2,640,357.37

¹ Deduct; Credit to "Arrowrock Dam," due to transfer of value of camp buildings to "Permanent improvements."

140 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Feature costs of Boise project to June 30, 1919—Continued.

Feature.	Fiscal year 1919.	To June 30, 1919.
Drainage system:		
Pioneer district.....	31,672.22	298,397.63
Nampa-Meridian district.....	31,599.30	309,345.94
Cooperative district.....	1 63,344.44	
Fargo Basin.....		37,771.48
From Deer Flat.....		31,796.98
Riverside district.....	89,236.59	91,821.44
Miscellaneous—		
Gibbons drain.....		1,038.31
West End drain.....		2,342.54
General investigations and surveys.....		4,242.12
	89,163.67	776,754.44
Power system: Boise River power plant:		
Original cost.....		254,795.25
Less items transferred to cost of Arrowrook Dam.....		50,489.98
		195,305.27
Farm units.....		46,953.50
Permanent improvements:		
Distribution unit—		
Project office building and grounds.....		21,749.07
Watermaster's headquarters—		
Lower embankment.....		4,217.64
Wilder.....		3,993.32
Upper embankment.....		2,531.91
Kuna.....		3,375.49
Rock spur.....		947.18
Camp Three.....		3,495.11
Ditchriders' headquarters—		
Golden Gate drop.....		796.83
Fargo drop.....		2,177.95
Robinson Hill pipe line.....		222.84
Eight Mile.....		375.32
Barber wasteway.....		178.01
Drop into Deer Flat Reservoir.....		326.39
Gatetender's house—		
Indian Creek drop.....		383.29
Indian Creek diversion works.....		308.83
Development Government farms.....		6,235.24
Roads.....		272.41
Miscellaneous small improvements.....	1,380.93	3,383.13
Storage unit—		
Gatetender's house, Arrowrook Dam.....		4,004.01
Camp buildings at Arrowrook (permanent).....	3,400.00	3,683.85
Camp buildings at diversion dam (permanent).....	1,880.00	1,882.36
Roads.....		76,496.72
	6,660.93	141,026.10
Telephone system:		
Distribution unit.....		34,377.50
Storage unit.....		9,675.20
Operation and maintenance during construction (water-rental basis).....		1,079,298.13
Total cost of construction features.....	263,335.61	12,696,331.87
Unadjusted clearing accounts.....		* 1,201.42
Balance in plant accounts.....		63,085.42
Gross construction cost.....	263,335.61	12,758,215.87
Less revenues earned during construction period—		
Rentals of buildings.....		27,267.31
Rental of grazing and farming lands.....		14,830.50
Net power earnings (prior to public notice).....		59,515.11
Rentals of irrigation water.....	2,847.63	657,006.18
Contractors' freight refunds.....		13,082.53
Other revenues, unclassified.....	30.68	17,141.05
Loss on hospital operations.....		* 4,067.23
Other profits on operations, unclassified.....	142.58	164.25
	3,020.89	784,939.70
Net construction cost.....	260,314.72	11,973,276.17

* Deduct: Credit to "Cooperative district" due to equal division of cost of district between the Pioneer district and the Nampa-Meridian district.

* Deduct

Cost statement by calendar years, Boise project.

	Operation and maintenance.				Total cost.
	Construction.	During construction.	Under public notice.	Total.	
Year ending Dec. 31—					
1902.....	\$2,274.51				\$2,274.51
1903.....	2,965.58				2,965.58
1904.....	20,909.47				20,909.47
1905.....	19,354.12				19,354.12
1906.....	602,924.72				602,924.72
1907.....	731,141.73	\$9,455.80		\$9,455.80	740,597.53
1908.....	823,957.25	4,973.78		4,973.78	828,931.03
1909.....	886,509.76	41,388.89		41,388.89	877,898.65
1910.....	785,274.36	64,406.52		64,406.52	857,680.88
1911.....	2,025,063.46	51,841.70		51,841.70	2,076,905.16
1912.....	1,457,290.75	84,226.36		84,226.36	1,571,517.11
1913.....	1,126,916.73	137,330.56		137,330.56	1,264,247.29
1914.....	1,821,817.19	131,607.44		131,607.44	1,962,924.63
1915.....	769,368.08	170,723.36		170,723.36	940,091.44
1916.....	447,236.14	135,231.51		135,231.51	582,467.65
1917.....	157,512.76	248,022.21		248,022.21	90,509.45
1918.....	67,179.85		\$294,216.48	294,216.48	361,396.33
January to June 30, 1919.....	197,032.80		139,723.61	139,723.61	336,756.41
Plant accounts, June 30, 1919.....	11,617,123.74	1,079,208.13	433,940.09	1,513,148.22	13,130,271.96
Unadjusted clearing accounts.....	1,201.42		1,657.63	1,657.63	1,659.05
Total.....	11,679,007.74	1,079,208.13	428,282.46	1,507,490.59	13,186,498.33

¹ Deduct.

Cost statement by fiscal years, Boise project.

Year ending June 30—	Operation and maintenance.				Total cost.
	Construction.	During construction.	Under public notice.	Total.	
Period 1902 to 1906, inclusive.....	\$177,614.16				\$177,614.16
1907.....	825,797.94	\$4,606.26		\$4,606.26	830,404.20
1908.....	861,209.53	9,529.25		9,529.25	870,738.78
1909.....	775,939.73	29,898.01		29,898.01	805,837.74
1910.....	673,232.59	46,499.71		46,499.71	719,732.30
1911.....	1,226,236.26	49,059.84		49,059.84	1,275,296.10
1912.....	2,109,108.94	65,027.15		65,027.15	2,174,136.09
1913.....	1,161,361.85	117,709.90		117,709.90	1,279,071.75
1914.....	1,560,385.86	144,422.58		144,422.58	1,704,808.44
1915.....	1,521,283.87	147,643.91		147,643.91	1,668,927.78
1916.....	395,631.08	133,520.11		133,520.11	529,151.19
1917.....	219,848.90	173,030.26		173,030.26	392,879.16
1918.....	153,862.58	158,261.15	\$130,333.66	288,594.81	134,732.23
1919.....	263,335.61		303,606.43	303,606.43	566,942.04
Plant accounts June 30, 1919.....	11,617,123.74	1,079,208.13	433,940.09	1,513,148.22	13,130,285.42
Unadjusted clearing accounts.....	1,201.42		1,657.63	1,657.63	1,659.05
Total.....	11,679,007.74	1,079,208.13	428,282.46	1,507,490.59	13,186,498.33

¹ Deduct.

Estimated cost of contemplated work, Boise project, during fiscal year 1920.

Principal features.	Estimated cost during fiscal year 1920.
Canal system, North Side subunit.....	\$76.00
Drainage system, Riverside District.....	100.00
Operation and maintenance, water rental.....	14.00
Operation and maintenance, public notice.....	234.00
Reimbursable accounts.....	4.00
Total.....	428.00

142 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating cost and revenues, Boise project, to Dec. 31, 1918.

	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works:						
Arrowrock Reservoir.....	\$16,349.83	\$389.97	\$16,739.80	\$16,349.83	\$389.97	\$16,739.80
Deer Flat Reservoir.....	5,331.71	1.25	5,332.96	5,331.71	1.25	5,332.96
	21,681.54	391.22	22,072.76	21,681.54	391.22	22,072.76
Canal system:						
Headworks.....	819.57	1,654.01	2,473.58	819.57	1,654.01	2,473.58
Main Canal—						
First section.....	9,030.26	21,677.03	30,707.29	9,030.26	21,677.03	30,707.29
Second section.....	1,929.68	2,237.57	4,167.25	1,929.68	2,237.57	4,167.25
	11,779.51	25,568.61	37,348.12	11,779.51	25,568.61	37,348.12
Lateral system:						
From Main Canal—						
First section.....	8,346.64	41,882.17	50,228.81	8,346.64	41,882.17	50,228.81
Second section.....	40,374.30	65,843.14	106,217.44	40,374.30	65,843.14	106,217.44
From Upper Deer flat embankment.....	2,434.51	4,366.12	6,800.63	2,434.51	4,366.12	6,800.63
From Lower Deer flat embankment.....	21,213.92	41,256.29	62,470.21	21,213.92	41,256.29	62,470.21
Penitentiary lateral.....	773.08	1,752.81	2,525.89	773.08	1,752.81	2,525.89
	73,142.45	155,100.53	228,242.98	73,142.45	155,100.53	228,242.98
Drainage system.....		5,129.88	5,129.88		5,129.88	5,129.88
Undistributed expenses:						
Hydrometry.....	604.15		604.15	604.15		604.15
Buildings.....		702.75	702.75		702.75	702.75
Roads.....		115.84	115.84		115.84	115.84
Camp maintenance.....		132.97	132.97		132.97	132.97
Telephone expense.....	97.42	108.43	205.85	97.42	108.43	205.85
General expense.....	336.83	1,589.73	1,926.56	336.83	1,589.73	1,926.56
Engineering and inspection.....		16.60	16.60		16.60	16.60
Superintendence and accounts.....	477.63	817.20	1,294.83	477.63	817.20	1,294.83
Miscellaneous.....	180.26	277.49	457.75	180.26	277.49	457.75
	662.11	760.63	1,422.74	662.11	760.63	1,422.74
Subtotal (operation and maintenance cost).....	107,265.61	186,950.87	294,216.48	107,265.61	186,950.87	294,216.48
REVENUES,²						
Rentals of buildings during operation period.....			1,237.35			1,237.35
Rentals of irrigation water.....			19,434.18			19,434.18
Operation and maintenance charges accrued.....			207,023.48			207,023.48
Other revenues, unclassified, earned during operating period.....			16,926.99			16,926.99
			244,622.00			244,622.00
Difference, deficit.....			49,594.48			49,594.48

¹ Deduct: credits shown are result of overdistribution of clearing accounts.

² Items as shown on June 30, 1919, balance sheet minus accruals and adjustments made in 1919, as follows:

Rentals of buildings.....	\$317.65
Rentals of irrigation water.....	1,214.47
Operation and maintenance charge accrued.....	1,804.06
Miscellaneous.....	467.07

3,803.25

This arrangement made necessary on account of accruals for 1918 not being taken into books prior to Jan. 1, 1919.

IDAHO, KING HILL PROJECT.

WALTER WARD, project manager, King Hill, Idaho.

LOCATION.

Counties: Elmore, Gooding, Owyhee, and Twin Falls.

Townships: 5 and 6 S., Rs. 8 to 13 E., Boise meridian.

Railroads: Oregon Short Line.

Railroad stations and estimated population, June 30, 1919: Glenna Ferry, 1,200. King Hill, 150; Hannett, 50.

WATER SUPPLY.

Source of water supply: Malad River, fed by numerous large springs.

Area of drainage basin: Underground source, area indeterminate.

Annual run-off in acre-feet: Approximately 1,000,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water for season 1919: Canals and laterals are constructed so that a partial supply can be delivered to about 14,500 acres.

Length of irrigation season: April 1 to October 10—193 days.

Average elevation of irrigable area: 2,750 feet above sea level.

Rainfall on irrigable area: Seven-year average, 9.4 inches.

Range of temperature on irrigable area: -17° to 111° F.

Character of soil on irrigable area: Ranges from light to heavy sandy loam; heavy clay.

Principal products: Alfalfa, early vegetables, grains, fruit, and stock.

Principal markets: Portland, Boise, and small towns in southern Idaho.

CHRONOLOGICAL SUMMARY.

First irrigation by King Hill Irrigation Co., season of 1909.

Reconnaissance made and preliminary surveys begun by the United States in 1916.

Construction recommended by board of engineers August 17, 1916.

Construction authorized by Secretary July 2, 1917.

Reconstruction work begun by Reclamation Service in February, 1918.

Project 59.4 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the King Hill project provides for the diversion of water from the Malad River, about 1 mile above its confluence with the Snake River, the conveyance of the water through a flume for about 4,000 feet, and the delivery of 300 second-feet to the canal system of the project by the Idaho Power Co.

The project main canal is approximately 52 miles long and crosses the Snake River at two points by means of siphons on steel bridges. About half the irrigable acreage lies on each side of the Snake River. The acreage to be supplied by gravity as now shown by the irrigable acreage plats is 15,811 with 574 acres to be supplied by pumps.

The present plans for the reconstruction of the project call for the building of several concrete flumes, concrete and wood stave siphons, wood stave flumes, gunite flumes, and gunite lining.

SUMMARY OF GENERAL DATA FOR KING HILL PROJECT TO END OF FISCAL YEAR 1919.**Areas:**

Irrigable acreage when project is complete.....	16,385
Public land entered to June 30, 1919.....	9,034
Public land open to entry on June 30, 1919.....	372
State land June 30, 1919.....	1,071
Railroad land June 30, 1919.....	459
Private land June 30, 1919.....	5,449
Acreage service could have supplied in season of 1918 ¹	14,500
Estimated acreage service can supply in season 1919 ¹	14,500
Estimated acreage service can supply in season 1920 ¹	14,500
Acreage irrigated season of 1918 ²	1,849
Acreage cropped under irrigation season of 1918 ²	1,677

Crops:

Value of irrigated crops season of 1918 ²	\$45,588
Value of irrigated crops per acre cropped ²	\$27.18

Finances:

Net construction cost to June 30, 1919.....	\$594,439.80
Per cent completed on June 30, 1919.....	59.4
Appropriated for fiscal year 1920.....	\$332,000.00
Estimated per cent complete by June 30, 1920.....	79.5
Proposed appropriation for fiscal year 1921.....	\$320.00
Estimated per cent complete by June 30, 1921.....	100.0
Appropriation fiscal year 1919.....	\$423,000.00
Increase under 10 per cent provision.....	42,300.00
Increase miscellaneous collections.....	7,680.30
Increased compensation.....	15,921.16
	\$488,901.46

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$377,350.04
Transfers.....	44,881.59
Current liabilities.....	16,765.84
Contingent liabilities.....	11,292.28
	\$450,289.75

Unencumbered balance on July 1, 1919..... 38,611.71

Drainage:

Mileage of open drains built to June 30, 1919.....	0.30
Estimated acreage protected by drains to June 30, 1919.....	600

CONSTRUCTION DURING FISCAL YEAR.

Canal system.—(a) Work completed: Three rather important structures were begun and completed during the fiscal year. They are as follows: Little Pilgrim siphon, One Mile siphon, and a combination flume and lining structure. Little Pilgrim siphon is a concrete structure with a 7-foot diameter barrel. One Mile siphon is similar, but the concrete barrel is 7½ feet in diameter. The combination structure is a lined section, the outer wall being vertical and having warped transitions at each end.

(b) Work in progress: Little reconstruction work can be carried on during the irrigation season on this project, and the only work in progress at the end of the fiscal year was in connection with the Four Mile flume. During the year 2,580 linear feet of the flume were placed, making a total to date of 3,860 linear feet, with about

¹ Only partial delivery, capacity insufficient.

² Based on crop report for 3,073 acres.

9,400 linear feet yet to be constructed. The portion of this flume that is now installed has expansion and contraction joints at 24 feet intervals. Two different types of flumes will be used in the construction of the remainder of this flume. One type will be semi-precast and the other combination concrete and gunite. The side walls of one type will be of precast slabs and the other of gunite. The floors of both will be concrete poured in place. Work is now being done preparatory to casting the side slabs for the semi-precast flume.

(c) Work begun: Work was begun on the Head End and One Mile flumes. These flumes are both concrete, 12 feet 6 inches wide and 5 feet 2½ inches deep; 4,488 linear feet of flume were placed during the year. Work was also begun on Big Pilgrim siphon. This is a 6-foot diameter wood-stave siphon and was all completed on June 30 except the concrete end structures.

Telephone system.—About 25 miles of metallic circuit telephone line were constructed.

Permanent improvements.—Six new employees' cottages were completed during the year, making 10 now at King Hill.

SEEPAGE AND DRAINAGE.

At the time the Government took over the reconstruction of the project one open drain about 0.3 mile long had been constructed. This drain protected about 600 acres of land in Pasadena Valley. No more drains are contemplated.

BOARD MEETINGS.

Date.	Subject.	Personnel.
Aug. 17, 1916	Report on King Hill project.....	A. J. Wiley, D. W. Cole, E. J. Hopson.
Sept. 12, 1917	King Hill reconstruction.....	D. C. Henny, J. L. Savage, J. H. Miner.
Oct. 29, 1917	Estimate to complete.....	D. C. Henny, Jas. Munn, J. H. Miner.
Apr. 17, 1918	Construction program.....	Jas. Munn, Walter Ward, J. H. Miner.
Apr. 18, 1918	Equipment for King Hill project.....	Do.
May 27, 1918	Changes in construction.....	J. H. Miner, Walter Ward, J. L. Savage.
May 17, 1919	Reconstruction program, fiscal year 1920.....	Jas. Munn, Walter Ward, J. L. Savage.
Do.....	Additional construction needed in excess of present contract.	Do.

OPERATION AND MAINTENANCE.

Operation and maintenance of the project is handled by the King Hill irrigation district. During the summer of 1918 poor deliveries were made, but nearly a continuous flow has been had during the season of 1919.

SETTLEMENT.

Few new settlers have moved onto the project, as reconstruction work has not progressed to a point such as to insure larger and more certain deliveries.

Settlement data, King Hill project.

(Based largely on estimates.)

Item.	1917	1918	1919
Total number of farms on project.....	225	225	225
Population.....	350	350	350
Number of irrigated farms.....	125	125	125
Operated by owners or managers.....	110	110	110
Operated by tenants.....	15	15	15
Number of towns.....	3	3	3
Population.....	1,350	1,425	1,500
Total population in towns and farms.....	1,700	1,775	1,850
Number of public schools.....	4	4	4
Number of churches.....	4	4	5
Number of banks.....	1	1	1
Total capital stock.....	\$20,000	\$20,000	\$20,000
Amount of deposits.....		\$183,436	\$245,545
Number of depositors.....		758	738

PRINCIPAL CROPS.

The principal crops grown on the project during 1918 were alfalfa, wheat, potatoes, fruit, melons, cantaloupes, and garden stuffs. Fruit was hit very hard last year with the frost, and poor delivery of water caused the crops in general to be very poor. Early potatoes, of which there is now a good crop, sold in the early part of June at 12½ cents per pound.

Crop report, King Hill project, Idaho, year 1918.

(Data furnished by the King Hill Irrigation District.)

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	1,106	Ton.....	3,112	2.81	\$11.71	\$36,432	\$32.94
Alfalfa seed.....	2	Bushel.....				50	25.00
Apples.....	206	Pound.....	94,550	459	.0825	3,068	14.89
Barley.....	6	Bushel.....	8	1½	1.50	12	2.00
Beans.....	6	do.....	1	½	6.00	6	1.00
Cane.....	1	Ton.....	2	2	10.00	20	20.00
Clover hay.....	25	do.....	45	1.8	15.00	675	27.00
Corn, Indian.....	38	Bushel.....	547	14.4	1.56	852	22.43
Corn, fodder.....	13	Ton.....	10	.77	9.00	90	7.00
Fruits, small.....	5	Pound.....				195	39.00
Garden.....	5					50	10.00
Hay.....	15	Ton.....	30	2	10.00	300	20.00
Oats.....	22	Bushel.....	100	4.5	.97	97	4.40
Pasture.....	72					1,440	20.00
Peaches.....	7	Pound.....	None.				
Peas.....	1	Bushel.....	None.				
Potatoes.....	43	do.....	697	16.2	1.96	1,366	31.70
Rye.....	3	do.....	None.				
Wheat.....	126	do.....	504	4	1.855	935	7.48
Less duplicated areas.....	24						
Total and average.....						45,588	27.18
Total crops.....	1,677						
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area farms reported.....		3,073	56	18.8
Nonbearing orchard.....	84		Total irrigable area farms reported.....		1,849	56	11.3
Young alfalfa.....	24		Total cropped area farms reported.....		1,677	56	10.2
Fall plowed.....	55						
Miscellaneous.....	9						
Total irrigated.....	1,849						

NOTE.—Low yields due to irregular flow caused by breaks in canal. The project was built under private auspices, and the Government is undertaking its reconstruction. Operation and maintenance are handled by the settlers through an irrigation district.

FINANCIAL STATEMENT.

Condensed balance sheet, King Hill project, June 30, 1919.

Inventory of materials and supplies on hand.....	\$65,506.90
Accounts receivable.....	4,186.31
Gross construction cost.....	\$591,362.37
Net loss on incidental operations.....	3,077.43
Net construction cost.....	594,439.80
Accounts payable.....	28,142.78
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	\$653,827.78
Collection, transfer, refund, and joint construction vouchers issued.....	17,837.55
Net investment.....	635,990.23

Feature costs of King Hill project, King Hill, Idaho, to June 30, 1919.

	Fiscal year 1919.	Total to June 30, 1919.
Examinations and surveys.....	1 \$320.19	\$20,092.80
Canal system:		
Four Mile flume.....	63,103.67	88,074.39
Wasteway at station 923.....	942.44	3,472.20
Roads—Hillstone's to Little Pilgrim.....	10,251.25	22,732.36
Wood-stave flume.....		3,573.90
Gravite flume.....	2,627.29	14,734.81
Wasteway at station 1394.....	68.92	954.38
Canal enlargement.....	20.81	3,220.98
Canal surveys.....	4,405.37	12,994.56
Road, Little Pilgrim to headworks.....	17,294.96	17,294.96
One Mile flume.....	79,733.51	79,733.51
Little Pilgrim siphon.....	29,822.89	29,822.89
Big Pilgrim siphon.....	52,688.39	52,688.39
Deer Gulch siphon.....	585.10	585.10
Siphon No. 1, betterments.....	15.49	15.49
Flume, station 71+84 contract.....	33,284.15	33,284.15
Flume, station 71+84, Government force.....	30,312.46	30,312.46
Gravite lining, station 170.....	258.88	258.88
Gravite repairs, station 170 to 235.....	960.04	960.04
Wasteway No. 3.....	83.36	83.36
Siphon, station 171.....	10,401.73	10,401.73
Wasteway No. 7.....	41.90	41.90
Wasteway No. 8.....	20.52	20.52
Trestle No. 8.....	69.90	69.90
Concrete flume, trestle section.....	56.06	56.06
Bridge at station 181.....	491.94	491.94
Big Pilgrimage bridge.....	1,518.87	1,518.87
Snake River bridge, King Hill.....	84.76	84.76
Snake River bridge at Glenns Ferry.....	65.28	65.28
Combination lining and flume.....	5,992.13	5,992.13
Total canal system.....	345,202.01	413,519.84
Farm units: Irrigable lands.....		2,910.78
Permanent improvements:		
Land purchased.....	205.40	1,117.60
Buildings.....	19,113.59	29,068.40
Total permanent improvements.....	19,318.99	30,176.00
Telephone system:		
Telephone system.....	7,872.00	7,872.00
Glenns Ferry line.....	386.80	286.80
	8,257.80	8,257.80
Total cost of construction features.....	372,458.61	474,957.22
Balance in plant accounts.....		110,009.48
Unadjusted clearing accounts.....		6,396.67
Gross cost to June 30, 1919.....	372,458.61	591,362.37
Less revenues earned during construction period:		
Rental of buildings.....	1,575.38	1,835.03
Contractor's freight refunds.....	440.41	440.41
Miscellaneous revenues.....	96.54	96.54
Loss on hospital operations.....	1 6,086.16	1 5,449.41
Total revenues.....	1 3,973.83	1 3,077.48
Net construction cost to June 30, 1919.....	376,432.44	594,439.80

Deduct.

Statement of cost by calendar years, King Hill project.

	Construc- tion.
Year ending Dec. 31—	
1916.....	\$1,687.94
1917.....	21,530.80
1918.....	254,305.47
Jan. 1 to June 30, 1919.....	197,433.01
Subtotal.....	474,957.22
Plant accounts to June 30, 1919.....	110,009.48
Unadjusted clearing accounts to June 30, 1919.....	6,395.67
Total.....	591,362.37

Statement of cost by fiscal years, King Hill project.

	Construc- tion.
Year ending June 30:	
1916.....	\$738.39
1917.....	1,252.41
1918.....	100,507.81
1919.....	372,458.61
Subtotal.....	474,957.22
Plant accounts to June 30, 1919.....	110,009.48
Unadjusted clearing accounts to June 30, 1919.....	6,395.67
Total.....	591,362.37

Estimated cost of contemplated work, King Hill project, during fiscal year 1920.

Feature.	Subfeature.	Principal feature.
Canal system:		
Concrete bench flumes.....	\$246,000	
Deer Gulch siphon.....	40,000	
Head End flume (including drainage protection).....	10,000	
Wasteway or regulating device (near headworks).....	4,000	
Wasteway No. 2.....	2,700	
Wasteway No. 9.....	2,800	
Wasteway No. 8 and trestle.....	3,000	
Big Pilgrim siphon (inlet and outlet).....	2,500	
King Hill bridge repairs.....	2,500	
Roads.....	3,000	
Surveys, testing, etc.....	1,000	
Tuanna flume and wasteway.....	13,000	\$330,500.00
Reimbursable accounts.....		1,500.00
Total.....		332,000.00

IDAHO, MINIDOKA PROJECT.

BARRY DIBBLE, project manager, Burley, Idaho.

LOCATION.

Counties: Minidoka and Cassia, Idaho; Jackson Lake Reservoir, Lincoln, Wyo.
Townships: 8 to 11 S., Rs. 21 to 25 E., Boise, meridian; Jackson Lake Reservoir, Tps. 44 to 46 N., Rs. 114 to 116 west, sixth principal meridian, Wyoming.
Railroads: Oregon Short Line.
Railroad stations and estimated population June 30, 1919: Rupert, 2,000; Heyburn, 300; Burley, 3,500; Paul, 500; Declo, 250; and Acequia, 50.

WATER SUPPLY.

Source of water supply: Snake River, supplemented by storage.
Area of drainage basin: 22,600 square miles above diversion dam.
Annual run-off in acre-feet of Snake River at Montgomery's ferry and Neeley (16,000 square miles), 1896 to 1918: Maximum 8,600,000; minimum 4,146,000; mean 6,800,000. South Fork of Snake River at Moran, Wyo. (620 square miles), 1904 to 1918; maximum 1,480,000; minimum 779,500; mean 1,180,000. The above record is based on the year October 1 to September 30.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 121,392 acres.

Area under water-right applications and rental contracts, season of 1919: 120,048 acres.

Length of irrigation season: From April 1 to October 20 (203 days).

Average elevation of irrigable area: 4,225 feet above sea level.

Rainfall on irrigable area: 13½ years; average, 12.10 inches; 1918, 7.80 inches.

Range of temperature on irrigable area: -24° to 104° F.

Character of soil of irrigable area: On north side of river, sand and sandy loam predominate; about one-third of the area is clay loam; on south side of river the soil is a disintegrated ash.

Principal products: Alfalfa, grasses, wheat, oats, beet seed, clover seed, sugar beets, and potatoes.

Principal markets: Pocatello, Idaho; Salt Lake, Utah; Butte and Helena, Mont.; Portland, Oreg.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders relating thereto (gravity unit): Public notices—March 9, 1907; November 23, 1908; February 11, March 30, 1909; February 7, March 22, June 10, October 13, November 3 and 25, 1910; January 23, December 30, 1911; March 21, 1912; June 23, 1913; September 24, 1914; February 27, March 20, 1915; March 4, May 4 and 27, June 10, 22, and 26, October 2, November 22, 1916; March 26, 1917. Orders—July 19, December 10, 1907; July 9, 1908; December 27, 1910; March 18 and 31, May 4, June 8, 1911; February 26, March 19 and 25, July 21, 1913; January 19, March 26 and 31, 1914; March 8 and July 13, 1915; April 7, June 26, 1916; March 23, 1917.

South side pumping unit: Public notices—November 3, 1915; May 25, 1916; April 10, 1917; April 2, 1918. Orders—March 24, 1911; March 19, May 13, October 10, 1912; March 25, 1913; March 23, 1914; March 1, 1915; March 23, 1917.

Location of lands opened: Tps. 8 to 11 S., Rs. 21 to 25 E., Boise meridian.

The annual operation and maintenance charge is based on the amount of water used. For 1919 the gravity unit, which is being operated by the Minidoka irrigation district, with headquarters at Rupert, Idaho, has been divided into seven zones, based on soil condition, in which 2 to 8 acre-feet of water are allowed for the minimum annual charge, this minimum charge to be determined at the end of the irrigation

season. The 1918 charge for operation and maintenance was fixed at \$1.50 per acre with a graduated charge for excess water. On the pumping unit the rate for 1919 and thereafter until further notice as set by public notice dated April 2, 1918, is 50 cents per acre-foot used up to and including June 5 and \$1 per acre-foot for water used after June 5 and on or before October 20, with a minimum of \$1.50 per acre for each irrigable acre, whether water is used or not. Provisions are made for the use of water after October 20, which is optional with the water users, at the rate of \$2 per day for each farm unit of 80 acres or fraction thereof, provided the charges for this service are deposited with the special fiscal agent before receiving the water. No service will be commenced, however, unless deposits aggregating \$200 per day for a reasonable period shall be made before October 20. No lands are operated on a rental basis.

CHRONOLOGICAL SUMMARY.

First surveys with reference to storage possibilities in 1902.
 Reconnaissance and preliminary surveys for main project begun March, 1903.
 Construction recommended by board of engineers March 21, 1904.
 Construction authorized by Secretary April 23, 1904.
 Minidoka dam completed September, 1906.
 Temporary dam on the Moran site, Jackson Lake, completed in 1907.
 First irrigation by Reclamation Service season of 1907.
 Jackson Lake Dam completed November 25, 1911.
 Contract for enlargement of Jackson Lake Reservoir entered February 25, 1913.
 Enlargement of Jackson Lake Reservoir completed, December, 1916.
 Gravity unit 99.7 per cent completed June 30, 1919, including drainage.
 South side pumping unit 95.9 per cent completed June 30, 1919.
 Jackson Lake storage 99.4 per cent completed June 30, 1919.
 Commercial unit 24.9 per cent completed June 30, 1919.
 Entire project (except extensions) 91.1 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Minidoka project provides for the diversion of the waters of the Snake River by a combined storage, diversion, and power dam about 6 miles south of Minidoka, Idaho, into two canal systems, one on either side of the river, watering lands in the vicinity of Acequia, Rupert, Heyburn, Paul, Declo, and Burley, Idaho. Power developed at the dam is utilized primarily for pumping water from the canals to irrigate high lands, but also for pumping for drainage purposes and for furnishing heat, light, and current for commercial use to the towns on the project and the farms adjacent to them. The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use this water in connection therewith. Storage for the project is provided mainly by a reservoir constructed in the upper drainage basin of Snake River, at Jackson Lake, Wyo. This is supplemented by the reservoir formed by the Minidoka dam and known as Lake Walcott. Jackson Lake Dam and Minidoka Dam are completed. Jackson Lake Dam has been raised 17 feet, making the capacity of the reservoir 789,000 acre-feet. During the 1919 fiscal year the river channel below Jackson Lake Dam was deepened, making available approximately 57,000 acre-feet additional storage which brings the available capacity of the reservoir to 846,000 acre-feet. The irrigation system for the gravity unit and the south side pumping unit, and the drainage system for the gravity unit have been completed.

**SUMMARY OF GENERAL DATA FOR MINIDOKA PROJECT TO END
OF FISCAL YEAR 1919.**

	Gravity.	South Side pumping.	Jackson Lake.	Commer- cial power.	New units.	Total.
Areas:						
Irrigable acreage when project is complete..	72,428	48,964				121,392
Public land entered to June 30, 1919.....	65,922	30,264				96,186
Public land open to entry on June 30, 1919	377					377
State land unsold June 30, 1919.....	13					13
Private land June 30, 1919.....	6,116	18,700				24,816
Acreage service could have supplied in sea- son of 1918.....	72,428	48,964				121,392
Estimated acreage ser- vice can supply in season 1919.....	72,428	48,964				121,392
Estimated acreage ser- vice can supply in season 1920.....	72,428	48,964				121,392
Acreage irrigated, sea- son of 1918.....	60,296	44,765				105,061
Acreage cropped under irrigation season of 1918.....	56,670	41,512				98,182
Crops:						
Value of irrigated crops, season of 1918	\$3,044,760.00	\$2,123,318.00				\$5,168,078.00
Value of irrigated crops per acre cropped	53.70	51.20				52.64
Finances:						
Net construction cost to June 30, 1919.....	\$2,828,901.90	\$2,719,518.52	\$103,762.04	\$115,848.97	\$37,112.25	\$5,805,043.68
Per cent completed on June 30, 1919.....	99.7	95.0	99.4	24.9		61.1
Appropriated for fis- cal year 1920.....						\$63,000.00
Estimated per cent complete by June 30, 1920.....	99.7	95.0	100.0			
Proposed appropria- tion fiscal year 1921						317,000
Announced construc- tion charges per acre: \$22, \$34, \$42, \$52, \$56.50, \$57.50, \$65.						
Appropriation fiscal year 1919.....						\$489,000.00
Decrease under 10 per cent provision.....						42,360.00
Increase miscellaneous collections.....						133,729.16
Special appropriation increased compensa- tion.....						15,550.90
Total.....						13,347.62
Total.....						609,327.68
Expenditures charge- able to 1919 appropria- tion:						
Disbursements.....						244,553.32
Transfers.....						21,220.07
Current liabilities.....						28,060.18
Contingent liabilities.						4,711.97
Total.....						298,545.54
Unencumbered balance on July 1, 1919.....						\$10,782.14

**SUMMARY OF GENERAL DATA FOR MINIDOKA PROJECT TO END
OF FISCAL YEAR 1919—Concluded.**

	Gravity.	South Side pumping.	Jackson Lake.	Commer- cial power.	New units.	Total.
Repayments:						
Value of construction waterright contracts.	\$2,862,531.45	\$2,753,308.97	\$429,412.50			\$6,045,252.92
Construction charges—						
Accrued to June 30, 1919, (including sup- plemental construction)	769,405.93	164,283.58	102,675.28			1,036,364.79
Collected to June 30, 1919, (including sup- plemental construction)	752,714.79	157,484.51	102,675.28			1,012,874.58
Uncollected on June 30, 1919 (including supplemental con- struction)	16,691.14	6,799.07				23,490.21
Operation and mainte- nance charges (pub- lic notice):						
Accrued to June 30, 1919	456,168.59	264,324.40	46,137.12			766,630.11
Collected to June 30, 1919	377,146.13	248,079.19	46,137.12			671,362.44
Uncollected on June 30, 1919	79,022.46	16,245.21				95,267.67
Water-rental charges—						
Accrued to June 30, 1919	63,388.30	109,899.36	60,844.86			234,132.52
Collected to June 30, 1919	63,388.30	109,899.36	60,844.86			234,132.52
Power charges—						
Accrued to June 30, 1919				253,890.26		253,890.26
Collected to June 30, 1919				235,072.48		235,072.48
Uncollected on June 30, 1919				18,817.78		18,817.78
Drainage:						
Estimated acreage damaged by seepage to June 30, 1919						560
Miles of open drains built to June 30, 1919	109					109
Estimated acreage pro- tected by drains to June 30, 1919						30,000
Estimated acreage to be protected by au- thorized system						30,000
Cost of drainage works to June 30, 1919						\$749,429.74

CONSTRUCTION DURING FISCAL YEAR.

Gravity system.—Under the terms of the contract entered into between the Reclamation Service and the Minidoka irrigation district, dated December 2, 1916, the district assumed the operation and maintenance of the gravity unit. All work on this unit was handled by the Minidoka irrigation district and paid for by them out of their operation and maintenance collections.

South Side pumping unit.—All construction on the irrigation system of this unit was completed on June 30, 1918. Replacements

and other work were handled by the United States Reclamation Service, and paid for out of the operation and maintenance funds. Practically all the new work on minor structures was done under field-work orders, and paid for by the landowner benefited. New lateral construction amounted to 0.23 of a mile. An extension of the powerhouse was planned to be started in the fall of 1918. The crew was being organized in September when it was found that the money available in the reclamation fund was not sufficient to complete the work; construction was therefore discontinued.

Permanent improvements.—During the fiscal year 11 cottages were constructed for the use of project employees who are being charged a reasonable rental for their use.

North Side pumping unit.—Surveys on this tract continued throughout the year. Sixty-nine thousand acres of topography, on a scale of 400 feet to the inch, were mapped. The topography is 63.5 per cent complete. Three hundred and forty miles of section lines were retraced, making the retracement 94 per cent complete. Three hundred miles of level control were completed, making this feature 72 per cent complete.

COMMERCIAL POWER.

One of the most interesting developments on the Minidoka project has been the use of electricity in the towns and on the farms for domestic and commercial purposes. The power-plant capacity that is required for irrigation pumping in the summer time is now entirely used in the winter time. The bulk of this power is used for electrically heating buildings in the towns. This electricity is sold at a very low rate. The Reclamation Service has installed substations in each of the towns and these now are all operating under full load in the winter. During the past year an extremely rapid growth has occurred in the demand for electricity on the part of the farmers. This demand has been supplied by installing substations at convenient points on 30,000-volt transmission lines of the project. From these substations the farmers, through their mutual organizations, build distribution systems to reach the members. The companies handle all details of the distribution and accounting with the membership, while the Reclamation Service delivers the power at wholesale to the company at the substation. This method of handling this business has worked out very satisfactorily and with economy both for the Reclamation Service and for the farmers. On June 30 nearly 700 farms were being supplied with electric power. A large additional number were reached by the lines, but for one reason or another have not been connected.

Three substations were built during the year to supply these rural companies. These were designated as Riverside, Central, and East End. These are of the outdoor type, transformers and switching apparatus being mounted on steel towers. Each of them has a present capacity of 30 kilowatts. The substation at Paul was completed during the year. This substation supplies the rapidly growing town of Paul as well as a large number of rural consumers.

Several new power companies were organized during the year, the principal among these being the Empire Electric Co., the Walcott Electric Co., the Ferry Light & Power Co., and the West Budge Power & Light Co., all of them mutual companies.

The revenue obtained from the sale of electricity during the fiscal year amounted to \$69,300 as compared with \$56,500 during the preceding year. This represents an increase of \$12,800, or 22.7 per cent.

A canvass of the consumers' load conditions was made on January 1, 1919, from which the information presented in the following tables was obtained. The first table shows the connected load and the second the amount of equipment that has been installed. This is in addition to the lines and pumping stations belonging to the Reclamation Service.

Connected load for Jan. 1, 1919, in kilowatts.

Contractor.	Consumers connected.	Lights.	Appliances, including motors up to 2 horse-power.	Motors, 2 horse-power and larger.	Heaters.	Total
		<i>Kilowatts.</i>	<i>Kilowatts.</i>	<i>Kilowatts.</i>	<i>Kilowatts.</i>	<i>Kilowatts.</i>
E. B. Skinner.....	52	24.815	24.005	146.635	138.000	332.045
Rupert Electric Co.....	550	290.145	342.615	261.375	1,666.000	2,560.135
City of Burley.....	1,125	433.885	1,183.805	387.375	2,696.000	4,691.065
Amalgamated Sugar Co.....	1	5.270	12.520	200.635	12.000	230.415
Minidoka North Side Power Co.....	14	6.410	11.310	3.750	12.000	33.470
Paul Electric Co.....	150	73.995	183.690	125.635	264.000	647.310
Farmers' Electric Co.....	5	1.970	3.215			5.185
Schodde Electric Co.....	10	5.520	7.850	18.750		32.120
Burley Milling & Elevator Co.....	39	20.300	28.420	12.375	.600	61.695
Village of Albion.....	135	66.530	261.190	19.875	277.750	625.345
Acequia Dairy & Produce Co.....	14	6.050	3.865	1.500		11.415
Rural Electric Co.....	15	9.745	14.400			24.145
Unity Light & Power Co.....	100	35.090	91.340	22.875		149.305
West End Power Co.....	6	2.445	7.180			9.625
Melcher Mining & Milling Co.....	1	9.000	2.915	233.250	14.800	259.165
Fruitland Drive Power & Light Co.....	3	2.800	1.365	3.750		7.915
North Hayburn Electric Co.....	5	1.655	3.030			4.685
Riverside Electric Co.....	53	25.565	27.800			53.365
East End Electric Co.....	25	10.090	6.245	1.500		17.835
Declo Light & Power Co.....	29	9.425	33.585	7.500		50.510
Central Electric Co.....	19	8.870	10.405			19.275
Small contracts.....	41	23.530	68.615	316.875	51.000	460.020
Total.....	2,394	1,073.105	2,329.965	1,783.635	5,119.350	10,296.045

Equipment installed.

Contractor.	Miles of line.		Distribution, transformers.	Maximum demand.
	Single-phase.	Three-phase.		
			<i>Kilowatts.</i>	<i>Kilowatts.</i>
E. B. Skinner.....	3.0	1.2	153	152.0
Rupert Electric Co.....	12.6	1.6	2,468	1,980.0
City of Burley.....	5.0	10.0	3,580	3,050.0
Amalgamated Sugar Co.....		.3	90	170.0
Minidoka North Side Power Co.....	3.3	.8	34	18.4
Paul Electric Co.....	14.2	6.5	430	296.0
Farmers' Electric Co.....	1.8		5	5.6
Schodde Electric Co.....	.3	3.0	35	10.8
Burley Milling & Elevator Co.....	1.3	.2	62	16.0
Village of Albion.....	4.0	1.2	366	330.0
Acequia Dairy & Produce Co.....	0.8		36	3.2
Rural Electric Co.....	2.4		25	4.6
Unity Light & Power Co.....	21.0	8.2	142	32.0
West End Power Co.....	1.5		12	2.4
Melcher Mining & Milling Co.....	.5	1.3	150	165.0
Fruitland Drive Power & Light Co.....	.5	.4	8	4.4
North Hayburn Electric Co.....	1.5		7	2.0
Riverside Electric Co.....	13.1	3.2	98	12.8
East End Electric Co.....	3.5	2.4	45	10.0
Declo Light & Power Co.....	1.9	10.0	52	7.6
Central Electric Co.....	2.5	5.1	22	4.8
Small contracts.....	4.5	7.2	194	455.0
Total.....	102.8	62.8	5,006	6,062.6

SEEPAGE AND DRAINAGE.

The drainage system on the gravity unit was operated effectively during the season of 1918. The system discharged 94,825 acre-feet of water, of which 7,540 acre-feet were pumped into one of the canals and used for irrigation. The total discharge shows an increase of 21,837 acre-feet over that of 1917. There is, however, a considerable element of error in these figures because of difficulty in the establishment of gauging stations which are not affected by outside conditions. There has been more or less controversy during the past year over the advisability of putting checks in some of the drains. The checks are proposed by some of the farmers with a view to regulating the height of the ground-water plane and using it to sub-irrigate the farms. The general idea is that if this were done it would reduce the amount of water that it is necessary to apply to the surface, particularly in the latter portion of the irrigation season. The farmers who oppose this view are usually those whose ground is so located that the water plane would come unduly near the surface if these checks were installed. On November 1, 1917, the directors of the Minidoka irrigation district applied to the Reclamation Service for permission to install checks in some of the drains, but after careful consideration the directors were informed that this was not regarded as advisable.

OPERATION AND MAINTENANCE.

Gravity unit.—The operation and maintenance of this unit was handled by the Minidoka irrigation district under contract made with the Secretary of the Interior dated December 2, 1916. The district was handicapped during the year by shortage of labor and, consequently, less than the usual amount of canal cleaning was done in the fall of 1918 and the spring of 1919. However, the system had been well cleaned during the preceding winter and the lack of cleaning at this time was not a serious matter. The irrigation district installed a scoop-wheel pumping plant to pump out of the C-2 canal, which results in giving considerably better service to the 1710-2, 1751, and 1752 laterals.

South Side pumping unit.—The operation and maintenance of this unit has been handled directly by the Reclamation Service. The winter was mild and work was carried on almost continuously, although with small crews. Labor was inefficient and difficult to secure, particularly in the fall of 1918. On July 26, 1918, a break occurred in the main South Side Canal and did some damage to adjacent land. The break was repaired and service resumed within two days. The South Side pumping stations shut down on October 20, 1918, and started again on April 28, 1919.

By a vote of the farmers at the election held on March 5, 1918, on the South Side pumping unit, the Burley irrigation district was organized; with the organization of the district, the old South Side Minidoka Water Users' Association (Ltd.), went out of existence.

General.—The precipitation during the winter of 1918-19 was light and although Jackson Lake Reservoir finished the irrigation season of 1918 with approximately 97,000 acre-feet of water in the reservoir, and although the gates were closed and all water stored after Septem-

ber 15, 1918, yet the reservoir did not fill, and in fact the maximum in the reservoir reached only 571,000 acre-feet on June 3, when it became necessary to let the natural flow past the dam in order to supply prior rights. Drawing on water stored in Jackson Lake Dam began on June 6, 1919. Lake Walcott was also drawn upon to supply the canals at Minidoka on June 6. At that time Lake Walcott was full, containing 60,000 acre-feet. Before June 30 it became very apparent that the irrigation season of 1919 was to be one of extremely short water supply.

Historical review, Minidoka project.

	1914	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water.....	117,000	120,000	120,300	120,852	121,392	121,392
Acreage irrigated.....	81,500	83,562	89,900	99,020	105,061	110,000
Miles of canal operated.....	520	590	615	633.19	634.37	634.60
Water diverted (acre-feet).....	604,000	609,484	640,432	616,228	745,821	.....
Water delivered to land.....	358,000	323,479	334,649	305,278	390,905	.....
Per acre of land irrigated (acre-feet).....	4.3	3.9	3.7	3.1	3.7	.....

SETTLEMENT.

Prosperous conditions continued during the 1919 fiscal year. Good prices were obtained for all farm products, and the yield of all the principal crops was heavy. Many farms changed hands, at high prices. The population continued to increase. The number of people on the farms was estimated at 8,490 and those in towns at 6,600. All towns have made a substantial growth during the year. In Burley a potato flour mill and starch factory, a dancing pavilion, several business blocks, and many new residences were constructed. The paving in the business section of the town was completed. At the election in November, 1918, the county seat of Cassia County was moved from the old town of Albion to Burley. In Rupert several new business blocks, a new school (the Pershing), and many new residences were constructed, and the sewer system completed. Paul voted \$42,000 bonds for water works system and other municipal improvements. Considerable concrete walk was laid in the various towns. An additional \$100,000 of highway bonds has been voted by the Burley highway district in Cassia County. In addition to the expenditures by the highway district the farmers have cooperated to gravel long stretches of lateral roads. The general condition of the roads on the pumping unit is now excellent. In the spring of 1918, the Paul-Heyburn highway district and the Rupert highway district each voted \$200,000 bond issues for improving roads. This, in addition to the State and Federal aid which will be given these highway districts, will put the roads on the gravity unit in much better shape than they have been in the past. The construction of good roads and the very general extension of electric power lines through the country have had a material effect in raising the prices of outlying farms until these bring almost as much per acre as the farms close to town.

Settlement data, Minidoka project.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project..	2,113	2,164	2,322	2,327	2,340	2,340
Population.....	5,200	5,800	6,468	7,467	8,490	9,000
Number of irrigated farms.....	1,741	1,713	1,760	2,196	2,208	.....
Operated by owners or managers.....	1,525	1,402	1,352	1,725	1,556	.....
Operated by tenants.....	216	311	408	470	652	.....
Population.....	5,200	5,800	5,800	7,467	8,490	9,000
Number of towns.....	5	5	5	6	6	6
Population.....	3,000	3,500	4,100	5,300	6,600	8,000
Total population towns and farms.	8,200	9,300	10,568	12,767	15,090	17,000
Number of public schools.....	21	21	21	20	21	28
Number of churches.....	13	21	21	25	25	25
Number of banks.....	6	6	6	6	8	8
Total capital stock.....	\$137,500	\$140,000	\$140,000	\$165,000	\$240,000	\$260,000
Amount of deposits.....	\$577,007	\$821,909	\$1,311,641	\$2,522,764	\$2,543,343	\$3,725,691
Number of depositors.....	4,119	4,721	6,370	7,350	10,663	11,086

PRINCIPAL CROPS.

The total production and crop value for the year 1918 were slightly larger than previous years. The area in cultivation on the project is now such a large percentage of the possible total that it is improbable that any great increase will be shown in the future. The average crop value per acre on the gravity unit was \$53.70; on the south side pumping unit, \$51.20; and for the whole project, \$52.64. Of the principal crops potatoes had the highest value, averaging \$121.71 per acre. Sugar beets stood second in value, averaging \$107.50 per acre. Alfalfa continued to be the principal crop with an increase of 2,957 acres or 6.9 per cent over 1917, and had the highest total value of \$3,203,000. The wheat acreage increased 6,021 acres or nearly 40 per cent over 1917, and is second in total value of \$1,028,000. Potatoes, sugar beets, clover seed, and oats follow in the order named.

Crop report, gravity unit, Minidoka project, Idaho, year of 1918.

(Data furnished by the Minidoka Irrigation district.)

Crop.	Area (acres).	Unit of yield.	Yields.		Per unit of yield.	Values.	
			Total.	Average per acre.		Total.	Per acre.
Alfalfa.....	28,593	Ton.....	112,764	3.95	\$13.00	\$1,465,942	\$51.03
Alfalfa seed.....	284	Bushel.....	1,093	3.8	9.60	10,493	37.00
Barley.....	698	do.....	22,288	31.9	1.40	31,203	44.70
Beans.....	562	do.....	6,733	12	4.20	28,279	50.49
Beets, sugar.....	2,448	Ton.....	26,795	11	10	267,957	109.40
Beet seed.....	130	Pound.....	65,304	502	35	22,856	176.90
Clover hay.....	796	Ton.....	1,999	2.5	13	25,987	32.66
Clover seed.....	1,228	Bushel.....	6,063	4.9	22	133,365	108.40
Corn.....	338	do.....	11,568	34	1.60	18,509	54.70
Corn fodder.....	55	Ton.....	218	4	10	2,184	40.00
Small fruits.....	29	Pound.....	26,490	906	.05	1,325	45.40
Garden.....	540	do.....				49,756	92.10
Hay mixed.....	216	Ton.....	218	1	10	2,188	10.10
Mangles.....	13	do.....	185	13.7	7	1,295	96.00
Millet.....	6	Bushel.....	32	5	9.60	307	49.00
Oats.....	2,996	do.....	92,629	31	1.00	92,629	31.00
Onions.....	25	do.....	610	24	2.40	1,464	57.40
Pasture.....	4,523	do.....				103,374	22.85
Peas.....	100	Bushel.....	1,895	19	2.40	4,549	45.70
Potatoes.....	2,318	do.....	440,625	190	.75	330,469	142.66
Rye.....	151	do.....	2,142	14.2	1.90	4,070	27.00
Wheat.....	9,013	do.....	241,063	26.8	1.85	445,967	49.59
Flax seed.....		do.....	2	20	2.80	7	56.00
Sweet clover seed.....		do.....	15	30	9.00	135	270.00
Onion seed.....	1	do.....	16	16.66	27.00	450	450.00
Miscellaneous.....	1,898	do.....					
Less duplicated acreage.....	291						
Total cropped acreage.	56,670		Total and average.....			3,044,760	53.70
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area farms reported.....		71,165	1,420	98.8
Nonbearing orchard.....			Total irrigated area farms reported.....		60,296	1,420	84.0
Young alfalfa.....			Under water-right applications.....		60,296	1,420	98.8
Less duplicated areas.....			Total cropped area farms reported.....		56,670	1,420	78.9
Total irrigated acreage.	60,296						

NOTE.—Of the above, 56,670 acres counted as total cropped, 981.5 acres yielded nothing due to destruction by predatory animals.

Crop report, South Side pumping unit, Minidoka project, Idaho, year 1918.

Crop.	Area (acres).	Unit of yield.	Yields.			Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa.....	17,124	Ton.....	56,684	3.3	\$13.00	\$736,892	\$43.03	
Alfalfa seed.....	71	BusheL.....	219	3	9.60	2,102	29.61	
Barley.....	676	do.....	19,249	28.4	1.40	26,949	39.86	
Beans.....	97	do.....	2,106	21.7	4.20	8,845	91.49	
Beets.....	2,284	Ton.....	24,076	10.5	10.00	240,760	105.41	
Clover.....	344	do.....	817	2.3	13.00	10,621	30.87	
Clover seed.....	1,849	BusheL.....	6,615	3.5	22.00	145,530	78.70	
Corn.....	68	do.....	484	7.1	1.60	774	11.38	
Corn fodder.....	4	Ton.....	10	2.5	10.00	100	25.00	
Fruits, small.....	9	Pound.....	36,330	4,086.6	.02	727	80.73	
Garden.....	361	do.....				25,711	71.22	
Hay.....	12	Ton.....	48	4	15.00	720	60.00	
Oats.....	1,478	BusheL.....	50,645	34.2	1.00	50,645	34.26	
Onions.....	3	do.....	260	86.7	1.50	390	130.00	
Pasture.....	1,936	do.....				33,381	17.24	
Peas.....	196	BusheL.....	2,813	14.3	2.40	6,751	34.44	
Potatoes.....	2,447	Sack.....	332,598	135.9	.75	249,449	101.94	
Rye.....	22	BusheL.....	95	4.3	1.90	180	8.20	
Wheat.....	12,085	do.....	314,590	26	1.85	581,991	48.15	
Mangles.....	20	Ton.....	160	8	5.00	800	40.00	
Without yield ¹	430							
Less duplicated areas.....	4		Total and average.....			2,123,318	51.20	
Total cropped acre- age.....	41,512							
			Areas.	Acres.	Farms.	Per cent of project.		
Irrigated, no crop:								
Nonbearing orchard.....	200	Total irrigable area farms reported.....			48,664	788	99	
Young clover.....	89	Total irrigated area farms reported.....			44,765	788	91	
Young alfalfa.....	1,500	Under water-right application.....			44,765	788	91	
Ground fall plowed.....	727	Total cropped area farms reported.....					41,512	85
Miscellaneous.....	2,000							
Less duplicated areas.....	1,263							
Total irrigated acre- age.....	44,765							

¹ Crops destroyed by predatory animals.**FINANCIAL STATEMENT.***Project balance sheet, Minidoka project, June 30, 1919.*

Cash.....		\$1,143.78
Inventory of materials and supplies on hand.....		37,676.45
Accounts receivable:		
Current.....	\$138,465.38	
Unaccrued—Construction water-right charges unaccrued.....	5,608,898.13	
		5,147,353.51
Construction work contracted.....		4,711.97
Gross construction cost.....	5,998,983.10	
Less construction revenue earnings.....	\$172,661.47	
Less cost adjustments.....	21,157.95	
		183,819.42
Net construction cost.....		5,806,043.68
Gross operation and maintenance cost.....	916,750.54	
Less operation and maintenance revenue earnings.....	89,088.94	
		827,661.60
Accounts payable.....		28,060.18
Contingent obligations.....		5,839.60
Collections and contracts of specific amounts for repayments to reclamation fund.....		6,827,114.52
Miscellaneous accruals.....		309,161.16
Capital investment:		
Disbursement, transfers and joint construction vouchers received.....	7,364,500.06	
Collection, transfers, refund, and joint construction vouchers issued.....	2,711,145.67	
Net investment.....		4,653,444.39

Feature costs to June 30, 1919, Minidoka project.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examinations and surveys.....	\$32,048.28	\$128,233.00
Storage:		
Jackson Lake Dam.....		416,085.24
Jackson Lake bridge.....		33,316.89
Deepening river channel.....	31,715.34	44,677.81
	31,715.34	494,079.94
Pumping for irrigation:		
Five small pumping stations.....		29,521.47
South Side pumping station.....		474,047.96
		503,569.43
Canal system:		
Minidoka Dam.....	244.00	676,575.37
Main North Side Canal.....		746,154.58
Main South Side Canal.....		329,579.88
Feeders to South Side pumping stations.....		77,483.85
	244.00	1,829,799.68
Lateral system:		
Gravity unit.....	1 309.93	540,651.96
Pumping unit.....	61.43	577,332.21
	1 248.50	1,117,984.16
Drainage system.....		749,429.74
Power system:		
Powerhouse.....	2,853.97	455,317.40
Transmission lines.....	1 915.32	103,598.51
Substations.....	7,667.47	79,099.78
	9,606.12	638,015.69
Permanent improvements and lands:		
Buildings.....	26,861.21	130,784.44
Potato cellars.....		11,006.05
Roads.....		1,533.87
	26,861.21	143,324.36
Telephone system.....		28,396.01
Operation and maintenance during construction, water-rental basis.....		330,353.90
Operation and maintenance, added to and compounded with construction.....	12,313.86	12,313.86
Total cost of construction features.....	112,540.31	5,975,499.86
Balance in plant accounts.....		22,448.10
Unadjusted clearing accounts.....		915.14
Gross construction cost.....	112,540.31	5,998,863.10
Less revenues earned during construction period:		
Rental of buildings.....	3,269.92	14,485.67
Rental of farming and grazing land.....	1 5,747.25	1,161.96
Rental of irrigation water.....	12,138.93	146,222.00
Contractors' freight refunds.....	37.86	590.25
Other revenues unclassified.....	761.86	10,201.59
Cooperation for food conservation.....	849.01	849.01
Cost of transmission lines borne by power users.....	19,189.30	19,189.30
Profit on hospital operations.....	1 673.75	1,119.64
Total revenue.....	29,825.88	193,819.42
Net construction cost to June 30, 1919.....	82,714.43	5,805,043.68

¹ Deduct.

Statement of cost by calendar years, Minidoka project.

Year ending Dec. 31—	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1903.....	\$26,111.96				\$26,111.96
1904.....	83,053.65				83,053.65
1905.....	505,805.94				505,805.94
1906.....	736,028.48				736,028.48
1907.....	439,598.02		\$25,510.51	\$25,510.51	465,108.53
1908.....	367,628.31		35,279.52	35,279.52	402,907.83
1909.....	731,680.54	\$22,084.23	37,485.35	59,569.58	791,250.12
1910.....	599,919.79	57,654.75	48,043.74	105,698.49	705,618.28
1911.....	391,497.01	51,010.78	36,515.54	87,526.32	479,023.33
1912.....	307,484.75	68,250.72	41,239.03	109,489.75	416,974.50
1913.....	345,805.52	69,894.50	46,271.39	116,165.89	461,971.41
1914.....	628,437.47	61,458.92	69,496.97	130,955.89	759,393.36
1915.....	171,799.17		138,114.59	138,114.59	309,913.76
1916.....	89,966.66		163,080.89	163,080.89	253,047.55
1917.....	83,787.30		114,646.70	114,646.70	198,434.00
1918.....	63,603.26		98,776.71	98,776.71	162,379.97
Jan. 1 to June 30, 1919.....	72,938.13		62,298.60	62,298.60	135,236.73
Total.....	5,645,145.96	330,353.90	916,759.54	1,247,113.44	6,892,259.40
Unadjusted clearing accounts.....	915.14				915.14
Undistributed plant.....	22,448.10				22,448.10
Grand total.....	5,668,509.20	330,353.90	916,759.54	1,247,113.44	6,915,622.64

¹ Actual cost \$136,526.77, reduced by transfer of \$12,313.86 to operation and maintenance added to construction and \$25,436.20 to commercial power.

Statement of cost by fiscal years, Minidoka project.

Year ending June 30—	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1903.....	\$8,849.33				\$8,849.33
1904.....	34,525.27				34,525.27
1905.....	131,582.02				131,582.02
1906.....	880,029.87				880,029.87
1907.....	592,027.09				592,027.09
1908.....	287,168.95		\$39,911.00	\$39,911.00	327,079.95
1909.....	641,398.19		44,395.26	44,395.26	685,793.45
1910.....	628,646.68	\$55,847.50	52,618.63	108,466.13	737,112.81
1911.....	494,399.14	56,503.60	34,011.52	90,515.12	584,914.26
1912.....	321,014.35	65,795.47	33,412.14	99,207.61	420,221.96
1913.....	273,550.23	64,294.23	40,222.57	104,516.80	378,067.03
1914.....	805,843.45	70,305.60	71,558.08	141,863.68	947,707.13
1915.....	186,977.83	17,607.50	102,871.27	120,478.77	307,456.60
1916.....	59,122.97		144,464.02	144,464.02	203,586.99
1917.....	99,496.00		127,906.80	127,906.80	227,402.89
1918.....	87,974.19		102,211.41	102,211.41	190,185.60
1919.....	112,540.31		123,176.84	123,176.84	235,717.15
Total.....	5,645,145.96	330,353.90	916,759.54	1,247,113.44	6,892,259.40
Unadjusted clearing accounts.....	915.14				915.14
Undistributed plant.....	22,448.10				22,448.10
Grand total.....	5,668,509.20	330,353.90	916,759.54	1,247,113.44	6,915,622.64

¹ Actual cost \$127,647.61, reduced by transfer of \$25,436.20 to commercial power.

² Actual cost \$135,490.70, reduced by transfer of \$12,313.86 to operation and maintenance added to construction.

Estimated cost of contemplated work, Minidoka project, fiscal year 1920.

Principal features.	Estimated cost during fiscal year 1920.
Examination and surveys: North Side pumping unit.....	\$20,000
Power system: Minor extensions and connections.....	20,000
Permanent improvements: Employees' cottages.....	10,000
Operation and maintenance under public notice.....	170,000
Reimbursable accounts.....	2,000
Total.....	222,000

162 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating cost and revenues, Minidoka project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage:						
North Side gravity.....	\$8,290.92	\$83.28	\$8,354.20	\$47,222.22	\$92.95	\$47,315.17
South Side pumping.....	3,293.29	30.16	3,323.45	7,899.15	30.16	7,929.31
Jackson Lake, other companies.....	18,067.15	173.00	18,240.15	28,444.41	173.00	28,617.41
Jackson Lake, raising and blanketing dyke.....		3,949.03	3,949.03		3,949.03	3,949.03
Total storage system.....	29,656.36	4,215.47	33,871.83	83,565.78	4,245.14	87,810.92
Pumping:						
North Side gravity.....				3,826.62	1,413.31	5,239.93
South Side pumping.....	15,615.82	9,328.33	24,944.15	55,987.80	29,514.32	85,502.12
Central stations and transmission lines.....	4,625.31	1,970.02	6,595.33	30,355.13	13,569.82	43,924.95
Total pumping.....	20,241.13	11,298.35	31,539.48	90,169.55	44,497.45	134,667.00
Canals:						
Main Canal, North Side.....	331.95	334.60	666.55	35,406.18	70,483.06	105,889.24
Main Canal, South Side.....	1,069.02	2,184.31	3,253.33	7,261.80	14,569.87	21,831.67
Minidoka Dam, North Side.....	2,978.01	261.14	3,239.15	9,382.74	13,070.61	22,453.35
Minidoka Dam, South Side.....	1,447.11	180.56	1,627.67	2,946.87	3,180.07	6,126.94
Total canal system.....	5,826.09	2,960.61	8,786.70	54,997.59	101,303.61	156,301.20
Laterals:						
North Side distribution.....				105,575.68	211,151.38	316,727.06
South Side distribution.....	16,334.52	41,910.11	58,244.63	53,491.21	116,223.49	169,714.70
	16,334.52	41,910.11	58,244.63	159,066.89	327,374.87	486,441.76
Undistributed power.....	22,184.79	832.72	21,352.07	945.23	608.69	1,553.92
Total.....	49,873.31	61,217.26	111,090.57	398,745.04	478,029.76	866,774.80
Less operation and maintenance charges added to construction.....						12,313.86
Total cost.....						854,460.94
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			135,680.43			766,377.58
Operation and maintenance charges paid in advance by water-right applicants.....			\$37.11			5.26
Operation and maintenance charges paid and forfeited by water-right applicants.....						2,334.92
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			911.94			4,055.56
Rental of buildings during operating period.....			157.50			1,184.61
Rental of irrigation water.....			\$78,527.20			83,967.33
Other revenues unclassified, earned during operating period.....			\$12,195.06			30.56
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			\$2,942.08			\$6,161.69
Total.....			43,048.42			851,784.13
Difference, deficit.....			68,042.15			2,676.81

¹ Credit transferred to operation and maintenance commercial power system.

² Deduct.

NOTE.—1918 accruals in amount of \$135,680.43 were taken into the book accounts in 1919.

JACKSON LAKE ENLARGEMENT.

Jackson Lake Dam.—The crown of the dike was brought up to grade and to full width where undue settlement had occurred. Resloping and blanketing of the lower toe was completed. This work was necessitated by the raising of the dam under contract dated February 25, 1913, with the Kuhn Irrigation & Canal Co. and the Twin Falls Canal Co. In accordance with this contract the expense was borne by these companies. An addition was made to the rock fill below the north end of the gate section to replace the fill that was washed out. The deepening of the river channel below the dam and the addition to the fish ladder were completed.

For complete history of this feature, see previous annual reports.

Balance sheet, Jackson Lake Enlargement, July 1, 1919.

Assets:		
Gross construction cost.....	\$782,045.87	
Deposits, condemnation court (to be returned).....	1,107.50	
		\$783,153.37
Revenues and cost adjustments:		
Rentals of buildings.....	905.55	
Contractors' freight refunds.....	479.01	
Forfeiture by defaulting bidders.....	767.65	
Hospital loss.....	168.00	
		1,984.21
Net cost.....		781,169.16
Liabilities: Reserves—		
Interest received.....	2,066.23	
Payments by Kuhn Irrigation & Canal Co.....	598,998.18	
Payments by Twin Falls Canal Co.....	186,865.23	
		786,929.64
Investment of the United States:		
Disbursement vouchers, reclamation fund.....	\$741,636.20	
Disbursement vouchers, increased compensation fund.....	8.42	
Transfers received.....	109,301.34	
		850,945.96
Collection vouchers.....	843,848.19	
Transfers issued.....	12,858.25	
		856,706.44
Net investment.....		15,760.48
		781,169.16

¹ Deduct.

MONTANA. HUNTLEY PROJECT.

R. H. FIFIELD, Project Manager, Huntley, Mont.

LOCATION.

County: Yellowstone.

Townships: 2 and 3 N., Rs. 27 to 31 E., Montana meridian.

Railroads: Northern Pacific; Chicago, Burlington & Quincy.

Railroad stations and estimated population June 30, 1919: Huntley, 175; Osborn,¹ Worden, 150; Newton;¹ Pompeys Pillar, 120; Bull Mountain;¹ Ballantine, 150; and Anita,¹ Mont.

WATER SUPPLY.

Source of water supply: Yellowstone River.

Area of drainage basin: 12,000 square miles.

Annual run-off in acre-feet of Yellowstone River at Huntley (12,000 square miles), 1908 to 1918: Maximum, 7,391,600; minimum, 4,562,200; mean, 6,092,400.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 31,360 acres.

Area under water-right application, season of 1919: 27,976 acres.

Length of irrigation season: May 1 to September 30—153 days.

Average elevation of irrigable area: 3,000 feet above sea level.

Rainfall on irrigable area: 12 years, average 13.51 inches; 1918, 12.71 inches.

Range of temperature on irrigable area: -35° to 105° F.

Character of soil of irrigable area: Ranges from heavy clay to light sandy loam.

Principal products: Alfalfa, oats, sugar beets, and wheat.

Principal markets: Billings, Mont.; St. Paul and Minneapolis, Minn.; Denver, Colo.; Kansas City, Mo.; Seattle, Wash.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: May 21, 1907; March 3, 1909; March 13, 1912; June 23, August 9, 1913; September 24, November 3, 1914; February 27, March 20, October 9, December 23, 1915; January 15, March 15, 1916; March 20, 1917; April 4, 1918.

Location of lands opened: Tps. 2 and 3 N., Rs. 27 to 31 E., inclusive, Montana meridian.

Limit of area of farm units: 160 acres.

Duty of water: $2\frac{1}{2}$ acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land: First unit, entered before December 23, 1915, public land, \$30 per acre, additional charge of \$4 per acre payable to Indians, private land, \$50 per acre since December 1, 1913, additional charge of \$15 per acre for supplemental construction for all water-right applicants subject to the terms of the extension act; and all other water-right applicants who have agreed to the increased charge; public land entered since December 23, 1915, \$45 per acre. Second and third units, public land \$60 per acre, additional charge of \$4 per acre payable to Indians; private land, \$60 per acre.

Annual operation and maintenance charge: For all lands of the project, water delivered between July 8 and August 31, inclusive, \$1.10 per acre-foot; and for water delivered prior to July 8 and subsequent to August 31, 50 cents per acre-foot; a minimum charge of \$1.50 per irrigable acre, whether water is used or not, which minimum charge is credited to the amount due for water furnished at above rates; water-right applicants in the first unit who failed or refused to sign the contract for payment of the supplemental construction charge are required to pay an additional charge of \$1.50 per acre of irrigable land.

¹ Less than 25 population.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1904.
 Construction recommended by board of engineers, February 26, 1905.
 Construction authorized by Secretary, April 18, 1905.
 First irrigation by Reclamation Service, season 1908.
 First unit completed in 1908.
 Second unit completed in 1915.
 Entire project 50.65 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Huntley project provides for the diversion of water from the south side of the Yellowstone River about 2 miles above Huntley, Mont., into a main canal which extends down the valley about 27 miles to a point 2 miles east of Bull Mountain, Mont. The greater portion of the water is distributed by gravity. Fourteen miles below the head gates a 2-unit gravity pumping plant and a 2-unit power pumping plant are installed, and 100 second-feet of water are lifted 45 feet into a high-line canal. The high-line canal serves about 5,400 acres of land above the main canal in the vicinity of Ballantine, Anita, and Pompeys Pillar, Mont. The gravity pumping plant is a reinforced concrete building containing two pumping units, each with a capacity of about 30 second-feet, and each comprising a turbine water wheel directly connected with a centrifugal pump by means of a vertical shaft. Three hundred and ten net horsepower are developed by a 34-foot drop in the main canal. The power pumping plant is a wooden-framed building covered with galvanized iron, having a concrete foundation, containing two pumping units, each with a capacity of about 23 second-feet, and each comprising a 182-horsepower semi-Diesel engine and a centrifugal pump, belt drive.

The United States claims all waste, seepage, unappropriated spring and percolating waters arising within the project, and proposes to use such waters in connection therewith.

Further operations provide for the construction of drainage canals for the relief and protection of project lands from seepage conditions, the replacing of all remaining timber structures in the first unit with permanent type structures, installing a fire protection system for the Ballantine auxiliary pumping plant, rebuilding about 1,300 linear feet of lateral G in order to divert water from lateral F. G. L., and the reclamation of alkaline lands by farming methods.

SUMMARY OF GENERAL DATA FOR HUNTLEY PROJECT TO END OF FISCAL YEAR 1919.**Areas:**

Irrigable acreage when project is complete.....	32, 885
Public land entered to June 30, 1919.....	26, 460
Public land open to entry on June 30, 1919.....	938
Public land withdrawn on June 30, 1919.....	1, 525
Private land June 30, 1919.....	3, 967
Acreage service could have supplied in season of 1918.....	31, 360
Estimated acreage service can supply in season 1919.....	31, 360
Estimated acreage service can supply in season 1920.....	31, 360
Acreage irrigated season of 1918.....	19, 262
Acreage cropped under irrigation season of 1918.....	19, 262
Acreage dry farmed season of 1918.....	304

Crops:

Value of irrigated crops season of 1918.....	\$750, 963
Value of irrigated crops per acre cropped.....	\$39

Finances:

Net construction cost to June 30, 1919.....	\$1, 737, 864. 77
Per cent completed on June 30, 1919.....	90. 65
Appropriated for fiscal year 1920.....	\$95, 000. 00
Estimated per cent complete by June 30, 1920.....	94. 0
Proposed appropriation for fiscal year 1921.....	\$129, 000. 00
Estimated per cent complete by June 30, 1921.....	97. 0
Announced construction charges per acre, \$30, \$45, \$50, and \$60.	
Appropriation fiscal year 1919.....	\$112, 000. 00
Increased compensation.....	\$4, 496. 24
Increase, miscellaneous collections.....	\$17, 909. 39
	<hr/>
	\$134, 405. 63

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$74, 100. 83	
Transfers.....	6, 465. 26	
Current liabilities.....	7, 039. 25	
Contingent liabilities.....	3, 221. 20	
		\$90, 826. 54
Unencumbered balance July 1, 1919.....		43, 579. 09

Repayments:

Value of construction water right contracts.....	\$1, 310, 317. 24	
Construction charges—		
Accrued to June 30, 1919.....	300, 948. 84	
Collected to June 30, 1919.....	296, 031. 39	
Uncollected on June 30, 1919.....	4, 917. 45	
Operation and maintenance charges (public notice)—		
Accrued to June 30, 1919 ¹	205, 205. 54	
Collected to June 30, 1919 ²	190, 260. 96	
Uncollected on June 30, 1919 ³	14, 944. 58	
Water rental charges—		
Accrued to June 30, 1919.....	2, 631. 95	
Collected to June 30, 1919.....	2, 404. 11	
Uncollected on June 30, 1919.....	227. 84	

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	1, 500	
Miles of drains built to June 30, 1919—		
Open.....	16	
Closed.....	48	
Total.....	64	
Estimated acreage protected by drains to June 30, 1919.....	20, 000	
Estimated acreage to be protected by authorized system.....	24, 000	
Cost of drainage works to June 30, 1919.....	\$484, 821. 37	

CONSTRUCTION DURING FISCAL YEAR.

Pumping for irrigation.—The building for Ballantine auxiliary pumping plant was built and the 42-inch continuous wood-stave force pipe line was painted.

Canal system.—Two timber checks and two wooden turnouts on the main canal were replaced with concrete structures under supplemental construction.

Lateral system.—On lateral F. G. L. several small structures were built, which completed this lateral. One hundred and four timber structures were replaced with permanent type structures under supplemental construction.

Drainage system.—Owing to financial and labor conditions, only a small amount of drainage work was done; 4,792 linear feet of closed drain No. 22 were built.

Farm units—Farming operations.—On the reclamation of land in the vicinity of Newton, Mont., by farming methods, 38 acres of land were plowed and 100 acres were double disked.

¹ Includes supplemental construction charges accrued, to be collected as operation and maintenance, \$2,296.97.

² Includes supplemental construction charges collected as operation and maintenance, \$1,644.44.

³ Includes supplemental construction charges uncollected to be collected as operation and maintenance, \$622.53.

SEEPAGE AND DRAINAGE.

For the calendar year 1918 operation and maintenance and construction payments were suspended on 1,684 acres of land that were seeped or had not been fully reclaimed from the effects of seepage.

There were no marked changes in seepage conditions during the fiscal year.

OPERATION AND MAINTENANCE.

The irrigation season of 1918 extended from May 3 to October 1. The precipitation during May was about sufficient for crop growth, and consequently little irrigation water was used. June weather was exceedingly hot and dry, causing heavy irrigation. The conditions during July, August, and September were average.

The precipitation to June 30, in 1919, was the lightest in the history of the project, and irrigation during May and June was very heavy.

The entire system was operated both years, and there were no unusual breaks in the canals. During June, 1918, on account of the unprecedented hot weather and hot winds, and as the auxiliary pumping plant had not been completed, the water supply was inadequate under the pumping system, and some crops were damaged thereby.

Maintenance work was confined to repairing canal embankments and structures, replacing timber structures with concrete, and repairing closed drains. In June, 1918, the headquarters buildings at Huntley were moved to avoid being washed away by high water in the Yellowstone River, and in the fall and winter of 1918 and 1919 the headquarters were moved to Ballantine, Mont., which involved the moving of two cottages and a storehouse building from Huntley and the erection of an office, garage, blacksmith shop, barn, and water and sewerage system.

Historical review, Huntley project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to deliver water.....	28,805	30,826	32,271	32,271	31,360	31,360
Acreage irrigated.....	17,068	18,203	18,635	19,122	19,262	20,000
Miles of canal operated.....	194	210	210	229	229	229
Water diverted (acre-feet).....	55,543	52,383	67,873	64,344	47,982	60,000
Water delivered to land (acre-feet).....	24,429	17,634	21,123	21,274	20,182	24,000
Per acre of land irrigated (acre-feet).....	1.43	0.97	1.13	1.11	1.06	1.20

¹ Estimated.

SETTLEMENT.

All desirable unentered public land has been homesteaded and settlement is restricted to land transfers, filing of water-right applications on private land, relinquishments, and assignments.

The sale value of land is increasing each year, and patented lands are selling for from \$75 to \$250 per acre. During the fiscal year there were 363.5 acres of private land covered by water-right applications; 3 homestead entries changed hands by relinquishment, 3 entries by assignment, and 1 entry was relinquished.

Settlement data, Huntley project.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	586	646	691	691	691	691
Number of irrigated farms.....	535	530	550	553	561	549
Operated by owners or managers.....	432	383	400	368	359	315
Operated by tenants.....	103	147	150	185	202	234
Population.....	1,700	1,754	2,050	1,880	2,107	2,000
Number of towns.....	8	8	8	8	8	8
Population.....	475	475	468	610	599	599
Total population in towns and on farms...	2,175	2,229	2,518	2,490	2,706	2,599
Number of public schools.....	14	15	8	8	8	8
Number of churches.....	6	6	6	6	6	8
Number of banks.....	3	3	3	4	4	4
Total capital stock.....	\$60,000	\$60,000	\$60,000	\$85,000	\$85,000	\$85,000
Amount of deposits.....	\$220,000	\$239,000	\$307,414	\$498,000	\$540,434	\$560,000
Number of depositors.....	886	1,080	1,180	1,375	1,400	1,400
Number of relinquishments.....	4	2	5	5	2	1

PRINCIPAL CROPS.

The early spring of 1918, with sufficient moisture, made it possible to secure an excellent seed bed. All crops that were planted early came on rapidly under very favorable conditions. The acreage planted to sugar beets was comparatively small, due to the increase in price of grain and the prospective labor shortage. In July a destructive webworm did a great deal of damage to this crop, materially reducing the acreage yield. There was a large increase in the wheat acreage over previous years. The principal crops raised were alfalfa, 6,766 acres; sugar beets, 1,963 acres; oats, 2,006 acres; wheat, 6,306 acres. A hailstorm on June 18 did some damage to grain crops under the pumping system.

The weather conditions to June 30, 1919, were not favorable to crops other than alfalfa. The extremely hot and dry weather made it necessary to irrigate up most of the grain crops, and in many instances poor stands were obtained. The alfalfa crop was unusually good; the first cutting was harvested and the second growth well advanced at the end of the fiscal year.

Crop report, Huntley project, Montana, 1918.

Crop.	Area. (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	6,766	Ton.....	17,234	2.55	\$11.99	\$206,712	\$30.57
Alfalfa seed.....	48	Bushel.....	178	3.67	12.20	2,170	44.75
Barley.....	75	do.....	1,883	25.11	.98	1,853	24.71
Beans.....	128	do.....	955.33	7.47	4.52	4,320	33.80
Beets, sugar.....	1,963	Ton.....	16,299	8.30	10.00	162,990	83.00
Cane.....	24	do.....	67	2.73	10.00	670	27.34
Clover hay.....	45	do.....	123.5	2.74	12.06	1,490	33.11
Clover seed.....	224	Bushel.....	353.5	1.58	11.20	3,958	17.63
Corn.....	203	do.....	4,263	21.20	1.25	5,381	26.50
Millet.....	3	do.....	70	20.00	4.00	280	80.00
Garden.....	199	do.....				15,770	79.30
Hay (other than listed)...	108	Ton.....	138.85	1.29	11.90	1,650	13.27
Oats.....	2,006	Bushel.....	73,079.50	36.43	.79	57,869	28.86
Pasture.....	1,091	do.....				10,588	9.70
Potatoes.....	73	Bushel.....	9,611.6	132.12	.69	6,616	90.98
Wheat.....	6,306	do.....	138,305	21.93	1.94	268,616	42.60
Total irrigated and cropped.....	19,262		Total and average.....			750,963	39.00
			Areas.		Acres.	Farms.	Per cent of project.
			Total irrigable area farms reported.....		25,182	549	76
			Total irrigated area farms reported.....		18,958	549	57
			Under water-right applications.....		18,791	549	57
			Under rental contracts.....		167	7	57
			Total cropped area farms reported.....		19,262		58

FINANCIAL STATEMENT.

Condensed balance sheet, Huntley project, June 30, 1919.

Cash.....		\$236.09
Inventory of materials and supplies on hand.....		37,199.69
Current accounts receivable.....		21,570.72
Fixed accounts receivable—Construction water-right charges unaccrued.....		1,007,101.43
Construction work contracted.....		3,621.20
Gross construction cost.....	\$1,750,942.62	
Less construction revenue earnings.....	13,077.85	
Net construction cost.....		1,737,864.77
Gross operation and maintenance cost.....	343,708.98	
Less operation and maintenance revenue earnings.....	8,528.73	
Net operation and maintenance cost.....		335,180.25
Accounts payable.....		7,082.17
Contingent obligations.....		3,857.26
Collection and contracts for repayments of reclamation fund.....		1,525,382.05
Miscellaneous accruals.....		55,700.98
Capital investment:		
Disbursement and transfer vouchers received.....	2,322,584.94	
Less collection, transfer, and refund vouchers issued.....	771,833.28	
Net investment.....		1,550,751.66

Feature costs of Huntley project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....		\$10,901.06
Pumping for irrigation:		
Gravity pumping plant.....		2,311.02
Ballantine auxiliary pumping plant.....	\$17,375.40	66,703.98
Subtotal.....	17,375.40	69,015.00
Canal system.....	4,027.13	715,356.89
Lateral system.....	11,447.66	409,622.94
Drainage system.....	12,016.21	438,940.96
Flood protection.....		3,731.03
Farm units, experimental station.....		1,751.99
Permanent improvements.....	1,336.50	17,999.63
Telephone system.....		9,112.34
Operation and maintenance charges transferred to construction charges.....	180.92	1,533.49
Total cost of construction features.....	44,448.98	1,727,965.33
Balance in plant account.....		21,210.47
Unadjusted clearing accounts.....		1,766.82
Gross construction cost, June 30, 1919.....		1,750,942.62
Less revenues earned during construction period:		
Rentals of buildings.....		315.00
Rentals of grazing and farm lands.....		1,100.69
Rentals of telephone and tolls.....		406.79
Contractor's freight refunds.....		7,633.45
Other revenues unclassified.....		212.00
Profit on hospital operations.....	87.70	3,409.92
Total revenues.....	87.70	13,077.85
Net construction cost, June 30, 1919.....	44,361.28	1,737,864.77

1 Deducts.

Statement of cost by calendar years, Huntley project.

	Construction.	Operation and main- tenance under public notice.	Total cost.
Year ending Dec. 31—			
1934.....	\$2,393.91		\$2,393.91
1905.....	52,273.57		52,273.57
1933.....	353,398.54		353,398.54
1907.....	403,341.52		403,341.52
1908.....	35,304.16	\$13,062.17	48,366.33
1909.....	22,502.28	29,005.64	51,507.92
1910.....	18,889.90	23,831.19	42,721.09
1911.....	24,046.58	32,299.71	56,346.29
1912.....	125,979.24	29,838.83	155,818.07
1913.....	123,023.00	25,125.92	148,149.52
1914.....	138,078.35	28,734.61	166,812.96
1915.....	135,370.33	21,582.49	156,952.82
1916.....	114,772.14	25,792.11	140,564.25
1917.....	107,428.90	32,053.42	139,482.32
1918.....	61,443.87	34,686.95	96,130.82
Jan. 1 to June 30, 1919.....	9,728.44	30,205.68	39,934.12
Total.....	1,727,965.33	326,218.72	2,054,184.05
Plant accounts.....	21,210.47	17,049.89	38,260.36
Unadjusted clearing accounts.....	1,766.82	440.37	2,207.19
Total cost.....	1,750,942.62	343,708.98	2,094,651.60

Statement of cost by fiscal years, Huntley project.

	Construction.	Operation and main- tenance under public notice.	Total cost.
Year ending June 30—			
1935.....	\$30,272.90		\$30,272.90
1903.....	92,908.30		92,908.30
1907.....	486,052.11		486,052.11
1909.....	202,084.40	\$4,397.57	206,481.97
1903.....	53,393.50	20,381.13	73,774.63
1910.....	24,630.36	18,244.69	42,895.05
1911.....	10,028.37	36,650.72	46,679.09
1912.....	87,337.62	31,242.79	118,580.41
1913.....	86,614.76	24,443.26	111,058.02
1914.....	132,166.57	30,233.07	162,399.64
1915.....	122,995.27	24,057.05	149,052.32
1916.....	163,689.06	28,802.56	192,491.62
1917.....	100,808.20	22,086.10	122,894.36
1918.....	90,514.87	38,886.79	129,401.66
1919.....	44,448.98	44,792.99	89,241.97
Total.....	1,727,965.33	326,218.72	2,054,184.05
Plant accounts.....	21,210.47	17,049.89	38,260.36
Unadjusted clearing accounts.....	1,766.82	440.37	2,207.19
Total cost.....	1,750,942.62	343,708.98	2,094,651.60

Estimated cost of contemplated work, Huntley project, during fiscal year 1920.

Feature.	Sub-feature.	Principal feature.
Pumping system: Fire protection.....		\$500
Canal system.....		2,000
Lateral system:		
Construction.....	\$15,500	
Payment damage claims.....	1,500	
Drainage system.....		17,000
Farm units.....		16,000
Operation and maintenance under public notice.....		3,000
Reimbursable accounts.....		30,000
		500
Total.....		69,000

Operating cost and revenues, Huntley project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Pumping for irrigation.....	\$434.25	\$948.40	\$1,382.65	\$1,848.97	\$6,434.95	\$8,283.92
Canal and lateral systems:						
First unit.....	4,122.38	14,010.48	18,132.86	49,877.85	200,153.82	250,031.67
Second unit.....	900.81	6,314.67	7,215.48	2,013.22	11,492.21	13,505.43
Third unit.....	636.42	3,005.53	3,641.95	1,171.18	5,094.30	6,265.48
Subtotal.....	\$5,659.61	23,330.68	28,990.29	53,062.25	216,740.33	269,802.58
Maintenance permanent improvements, all units.....		2,337.71	2,337.71		5,404.15	5,404.15
Drainage system.....		2,018.16	2,018.16	78.24	14,078.56	14,156.80
	6,093.86	28,634.95	34,728.81	54,989.46	242,657.99	297,647.45
Less unpaid operation and maintenance charges added to construction.....			41.86			1,572.55
Total cost.....	6,093.86	28,634.95	34,696.95	54,989.46	242,657.99	296,074.90
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			32,723.47			203,969.77
Operation and maintenance charges paid in advance by water-right applicants.....			309.30			1,254.47
Operation and maintenance charges paid and forfeited by water-right applicants.....			1,112.39			3,290.84
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			477.14			1,595.37
Rental of buildings during operating period.....			702.08			5,763.54
Rental of irrigation water during operating period.....			667.34			1,445.30
Rental of telephone and tolls during operating period.....						2.35
Other revenues, unclassified, earned during operating period.....			9.85			228.14
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			1,694.16			1,909.30
Total revenues.....			35,307.41			215,640.48
Difference, deficit.....			\$ 620.46			80,434.42

¹ Deduct.² Surplus.

MONTANA, MILK RIVER PROJECT.

G. E. STRATTON, project manager, Malta, Mont.

R. M. SNELL, project manager, St. Mary storage unit, Browning. Mont.

LOCATION.

Counties: Teton, Glacier, Hill, Blaine, Phillips, and Valley.

Townships: 34 to 37 N., R. 14 W.; 34 N., R. 15 W.; 37 N., Rs. 11 to 13 W.; 33 to 37 N., Rs. 10 to 13 E.; 27 to 33 N., Rs. 17 to 42 E., Montana meridian.

Railroads: Great Northern and Canadian Pacific.

Railroad stations and estimated population June 30, 1919: Browning, 707; Havre, 6,000; Chinook, 1,500; Zurich, 50; Harlem, 700; Savoy, 80; Coburg, 80; Dodson, 400; Wagner, 50; Malta, 1,500; Bowdoin, 500; Saco, 500; Beverton, 50; Hinsdale, 500; Glasgow, 2,500; and Nashua, Mont., 400; Cardston and Woolford, Canada.

WATER SUPPLY.

Source of water supply: St. Mary Lakes, Swiftcurrent Creek, and Milk River.

Area of drainage basin: St. Mary Lakes and Swiftcurrent Creek, 298 square miles; Milk River at Havre, 5,550 square miles; Milk River at Malta, 11,850 square miles; Milk River at Hinsdale, 20,150 square miles.

Annual run-off in acre-feet of St. Mary River (including Swiftcurrent Creek): At Babb (298 square miles), 1902-1918—maximum, 830,000; minimum, 495,200; mean, 561,300. At international line (452 square miles), 1903-1917—maximum, 1,107,300; minimum, 514,100; mean, 721,000. Of Milk River: At Havre (5,550 square miles); 1898-1918—maximum, 426,000; minimum, 17,100; mean, 205,000. At Malta (11,850 square miles), 1903-1918—maximum, 712,800; minimum, 29,400; mean, 321,500. At Vandalia Dam (station formerly at Hinsdale, 6 miles upstream) (20,150 square miles), 1908-1918—maximum, 1,210,000; minimum, 140,300; mean, 545,600.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season 1919: 58,900 acres.

Area under rental contracts, season 1919 (to June 30): 24,842 acres.

Length of irrigation season: From April 16 to September 30, 170 days.

Average elevation of St. Mary storage: 5,500 feet above sea level.

Average elevation of irrigable area: 2,200 feet above sea level.

Rainfall on St. Mary storage: About 24 inches, average.

Rainfall on irrigable area: At Havre, 38 years, average 13.86 inches; 1918, 10.04 inches; at Malta, 13 years, average 12.98 inches; 1918, 9.2 inches.

Range of temperature on irrigable area, -56° to 107° .

Character of soil of irrigable area: Sandy loam, clayey loam, and some gumbo.

Principal products: Alfalfa, native blue joint hay, and other forage crops, grain, and vegetables.

Principal markets: Minneapolis and St. Paul, Minn., Great Falls, Mont., and local.

LANDS OPENED FOR IRRIGATION.

No lands have been opened for irrigation by public notice.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun by the Reclamation Service in 1902.

Construction conditionally authorized by Secretary March 14, 1903.

Construction of St. Mary storage unit authorized by Secretary March 25, 1905.

Construction begun July 27, 1906.

Dodson diversion dam completed in January, 1910.

Treaty with Great Britain relating to distribution between Canada and the United States of the waters of St. Mary and Milk Rivers signed January 11, 1909, and proclaimed May 13, 1910.

Water delivered for irrigation in 1911.

Recommendations covering construction of the project approved by Secretary June 13, 1912.

Dodson North Canal completed in 1914.

Sherburne Lake Reservoir begun June 29, 1914.

Vandalia diversion, Vandalia South, and Dodson South Canals completed in 1915.

Nelson Reservoir, first development completed 1915.

Nelson Reservoir South Canal begun 1915.

First water diverted from St. Mary River to North Fork of Milk River in 1916.

Bowdoin Canal begun 1915; first unit completed 1917.

First unit of Nelson Reservoir South Canal lateral system completed and water from Nelson Reservoir delivered for irrigation, 1918.

Milk River unit 44 per cent completed June 30, 1919.

St. Mary storage unit 78 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Milk River project provides for the storage of water in the Sherburne Lakes and the St. Mary Lakes, and its diversion through a canal 28.9 miles long, heading three-fourths of a mile below St. Mary Reservoir and discharging into the North Fork of Milk River, thence flowing through Canada for 216 miles and returning to the United States; the storage of water in Nelson Reservoir south of Milk River and 14 miles northeast of Malta; the discharge of stored water into Milk River as required; the diversion of water from Milk River by a dam near Chinook into two canals, one on each side of the river, for the irrigation of lands near Chinook and Harlem, comprising the Chinook division; the diversion of water from Milk River by a dam near Dodson into two canals, the northside canal irrigating lands near Dodson, Wagner, and Malta, and the southside canal conveying water to Nelson Reservoir and irrigating lands near Wagner, Malta, Bowdoin, and Ashfield; the irrigation of lands on the south side of Milk River and Beaver Creek in the vicinity of Saco and Hinsdale from the stored waters of Nelson Reservoir, comprising the Malta division; and in the Glasgow division the diversion of water at Vandalia Dam into a canal on the south side of Milk River for the irrigation of lands near Tampico, Glasgow, and Nashua. In case the normal flow of Milk River at Vandalia Dam is not sufficient for the irrigation of lands in the Glasgow division, the stored waters in Nelson Reservoir will be returned to Milk River and diverted again at Vandalia Dam. The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

The features of the above irrigation plan which have been completed are: 28.9 miles of the St. Mary Canal, except the second pipe line across St. Mary River and Halls Coulee, and the second barrel of the steel flume across Spider Lake Coulee; Vandalia diversion dam, including the automatic movable crest gates and Dodson diversion dam, including the movable crest; headworks for the Dodson North, Dodson South, and Vandalia South Canals; 10 miles of the Dodson South Canal, with a capacity of 900 second-feet, including Point of Rocks equalizing reservoir, 34 miles, with a capacity of 500 second-feet, and the lateral and waste-water systems to cover 15,000 acres; 28 miles of Dodson North Canal, with a capacity of 200 second-feet at its head, including the lateral and waste-water systems for 12,000 acres; 46 miles of Vandalia South Canal, with a capacity of 300 second-feet at its head, including the lateral and waste-water systems for 19,300 acres; 18 miles of Bowdoin Canal, with a capacity of 175 second-feet at its head, including lateral and waste-water systems for 8,000 acres; Nelson Reservoir South Main Canal with a capacity of 250 second-feet at its head; the first development of Nelson Reservoir to store 25,000 acre-feet; and the first unit of the Nelson Reservoir South Canal lateral system to cover 10,000 acres.

Work under construction consists of building two piers in Dodson Dam, together with the installation of movable crest gates and service bridge on this dam; the extension of lateral system, including structures, under the Nelson Reservoir South Canal system; the building of telephone lines from Nelson Reservoir to Beaverton and from Paisley to Willow Creek; other minor extensions of lateral systems; and Sherburne Lakes Reservoir Dam.

The principal features remaining to be completed are: Chinook Division, comprising the diversion dam and the North and South Canals; Nelson Reservoir to its final development; Chain Lakes Reservoir; Beaver Creek Reservoir and Canals; the second units of Bowdoin and Nelson Reservoir South Canal systems; the extension of Vandalia south canal and lateral system; St. Mary Lake and Sherburne Reservoirs; the second pipe line across St. Mary River and Halls Coulee crossing; and the second barrel of the steel flume across Spider Lake Coulee.

SUMMARY OF GENERAL DATA FOR MILK RIVER PROJECT TO END OF FISCAL YEAR 1919.

(Exclusive of St. Mary storage unit.)

Areas:		
Irrigable acreage when project is complete.....		181,000
Public land entered to June 30, 1919.....	37,948	
Public land withdrawn on June 30, 1919.....	22,829	
State land unsold, June 30, 1919.....	6,055	
Indian land.....	28,000	
Private land, June 30, 1919.....	86,168	
Acreage service could have supplied in season of 1918.....		58,000
Estimated acreage service can supply in season of 1919.....		58,900
Estimated acreage service can supply in season of 1920.....		60,000
Acreage irrigated season of 1918.....		24,843
Acreage cropped under irrigation season of 1918.....		23,800
Acreage dry farmed season of 1918.....		3,119
Crops:		
Value of irrigated crops, season of 1918.....	\$408,716.00	
Value of irrigated crops per acre cropped.....	\$17.17	
Value of dry-farmed crops, season of 1918.....	\$21,619.00	
Value of dry-farmed crops, per acre cropped.....	\$6.93	
Finances:		
Net construction cost to June 30, 1919.....	\$3,307,187.32	
Per cent completed on June 30, 1919.....	46	
Appropriated for fiscal year 1920.....	\$128,000.00	
Estimated per cent complete by June 30, 1920.....	48	
Proposed appropriation for fiscal year 1921.....	\$552,000	
Estimated per cent complete by June 30, 1921.....	53	
Appropriation fiscal year 1919.....	\$112,000.00	
Balance 1918 appropriation.....	6,512.09	
Increased compensation.....	5,728.26	
Special appropriation.....	1,026.61	
Increase miscellaneous collections.....	45,088.37	
Expenditures chargeable to 1919 appropriation:		170,355.33
Disbursements.....	125,690.65	
Transfers.....	12,061.35	
Current liabilities.....	9,356.37	
Contingent liabilities.....	3,623.55	
		150,731.92
Unincumbered balance on July 1, 1919.....		19,623.41
Water rental charges:		
Accrued to June 30, 1919.....	46,157.71	
Collected to June 30, 1919.....	45,576.76	
Uncollected on June 30, 1919.....		580.95
Drainage:		
Estimated acreage damaged by seepage to June 30, 1919.....		1,500

ST. MARY STORAGE UNIT.

Finances:		
Net construction cost to June 30, 1919.....	\$2,541,461.60	
Per cent completed on June 30, 1919.....	78	
Appropriated for fiscal year 1920.....	\$106,000.00	
Estimated per cent complete by June 30, 1920.....	81	
Proposed appropriation for fiscal year 1921.....	\$175,000.00	
Estimated per cent complete by June 30, 1921.....	87	
Appropriation fiscal year 1919.....	\$74,000.00	
Increased compensation.....	4,185.40	
Increase miscellaneous collections.....	12,671.91	
Special appropriation.....	604.73	
Unexpended balance previous appropriation.....	9,403.41	
		\$100,865.45

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$90,001.63	
Transfers.....	7,172.92	
Current liabilities.....	2,515.92	
Contingent liabilities.....	319.49	
		<hr/>
		\$100,009.96

Unincumbered balance on July 1, 1919..... 855.49

CONSTRUCTION DURING FISCAL YEAR.**MILK RIVER PROJECT DISTRIBUTION UNITS.**

Chinook division.—No work was in progress.

Malta division.—At Dodson diversion dam piers were constructed for a three-span service bridge, which was erected, and permanent movable crest gates, together with the necessary operating machinery, were attached thereto.

On Dodson North and South Canal several checks were added. A river cut-off, at Point of Rocks, mile 8, was constructed in an attempt to reduce saturation of the embankment adjacent to the Point of Rocks flume. On the lateral system additional metal culverts, wooden turnouts and checks, and measuring devices were placed.

On Nelson Reservoir South Canal system a concrete siphon was built on the NS-25 lateral, also wooden drops and other small structures. NS-116-17 was extended by contract, and NS-102 and NS-116 by Government forces.

Glasgow division.—At Vandalia diversion dam 500 cubic yards of rock paving were placed for protection of south bank below the dam.

On Vandalia South Canal considerable work was done raising the main canal and lateral banks, and a few wooden checks, turnouts, and measuring devices were built.

ST. MARY STORAGE UNIT.

Sherburne Lakes Dam.—During the fall of 1918 work was continued by Government forces. No construction work was done during the spring of 1919 on account of shortage of funds. When work was suspended the dam, with the exception of the spillway and spillway channel, had been completed except for a small section in the parapet wall left out for a roadway, a small amount of paving close to the parapet wall, and a small amount of earth and gravel fill back of the parapet wall. No attempt was made to complete the spillway crest or spillway channel on account of the slide of the north hillside adjacent to this structure.

SEEPAGE AND DRAINAGE.

Seepage is showing on some of the lands adjacent to Nelson Reservoir about 8 miles west of Saco, on lands under the Dodson South Canal between mile 13 and mile 19 between Wagner and Alkali Creek, also under the Dodson South Canal at about mile 33, near Strater, and under the Vandalia South Canal at about mile 30. These areas will doubtless require drainage at some future time and data are being collected upon which drainage systems will be designed. Surface waste water ditches are already constructed to tap practically each farm.

OPERATION AND MAINTENANCE.

From July 1, 1918, to the end of the operating season the delivery of water on a rental basis was in progress under the Dodson North, Dodson South, Nelson Reservoir South, and Vandalia South Canals. A severe storm occurred in the vicinity of Glasgow on August 15, which did considerable damage to the Vandalia South Canal; however, the storm also furnished sufficient moisture to tide crops over without serious inconvenience until repairs were made in this canal.

During 1919 all the above-mentioned canals were also operated for delivering water on a water-rental basis. The maximum diversion at Dodson Dam was 467 second-feet on May 18, 1919, and at Vandalia Dam 110 second-feet on June 11, 1919. The natural supply of the Milk River was augmented throughout the period covered by this report by a supplemental supply from the St. Mary River, delivered through the St. Mary Canal. The Dodson South Canal was put into operation on April 3, 1919, for the purpose of delivering storage water to Nelson Reservoir, and the other canals were put into operation as required for delivery of water to irrigable lands.

Nelson Reservoir was filled to capacity in September, 1918, and again in May, 1919. No water was drawn from Nelson Reservoir for redirection at Vandalia Dam during the season of 1918, but beginning June 10, 1919, it became necessary to supplement the natural flow at Vandalia Dam by stored water from Nelson Reservoir.

In addition to the operation mentioned above, St. Mary supplemental water was delivered to the private canal companies on Chinook division at the headgates of the following canals: Fort Belknap Canal & Irrigation Co., New Harlem Irrigation Co., and Paradise Valley Ditch & Irrigation Co. It was found that the diversion of the Fort Belknap Indian Agency Canal, which has a right only to the natural flow of the Milk River, was encroaching on the supplemental supply of St. Mary water and it became necessary to request the Indian authorities to decrease their diversion, which request was promptly complied with.

The water-rental rates were as follows: On Chinook division, in 1918, 50 cents per acre-foot for water delivered to the headworks of the private canal companies; on the Malta and Glasgow divisions, \$1 per acre-foot for water delivered on or before June 20, 1918, and \$1.50 per acre-foot for water delivered after that date; in 1919, on Chinook division, 50 cents per acre-foot for water delivered to the headworks of the private canal companies; on Malta and Glasgow divisions, for water delivered to obligated lands and lands subscribed to the Lower Milk River Water Users' Association, \$1.50 per acre-foot for water delivered to the land on or before June 20, 1919, and \$2 per acre-foot for water delivered after that date; for other lands, \$2 per acre-foot for water delivered on or before June 20, 1919, and \$2.75 per acre-foot for water delivered after that date.

Maintenance work was carried on throughout the open season although the greater part was done after the operating season in the fall and prior to the operating season in the spring. This largely comprised cleaning laterals of silt and vegetation and the repair of various structures. Some of the larger items were repairs to People's Creek Dyke, repairs of earthwork of the Vandalia South Canal caused by the August storm, and repairs to sluice gates on Vandalia Dam.

St. Mary Canal.—During the season of 1918, the St. Mary Canal was operated constantly from May 31 until September 7. A maximum head of 405 second-feet was carried and a total of 56,380 acre-feet were delivered to the North Fork of the Milk River. No serious operation difficulties occurred but a small maintenance crew was employed throughout the season raising canal banks, removing slide material from the canal section, puddling canal banks to prevent excessive leakage, and draining canal banks to prevent sliding.

Historical review, Milk River project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	13,440	40,000	40,400	45,000	58,000	58,900
Acreage irrigated.....	2,201	4,192	5,518	11,058	24,843	26,000
Miles of canal operated.....	53	96	184	204	275	330
Water diverted (acre-feet).....	4,229	13,041	² 61,534	68,503	² 74,924	78,000
Water delivered to land (acre-feet).....	1,760	2,894	3,700	11,195	16,900	24,000
Per acre of land irrigated (acre-feet).....	0.80	0.60	0.67	1.01	0.68	0.90

¹ Estimated.

² 33,040 acre-feet of water diverted delivered for storage in Nelson Reservoir.

³ Includes water for Nelson Reservoir.

SETTLEMENT.

The project has not been formally opened, and consequently no lands are now subject to entry. There have been some transfers of deeded lands and in these transfers some breaking up into smaller units was accomplished.

Three Government town sites have been opened on the project, one at Vandalia on July 1, 1916, but no lots have been sold; one at Zurich on June 23, 1917, when 41 lots were sold, 19 of which have been canceled for failure to make payments; one at Bowdoin on December 1 and 3, 1917, when 132 lots were sold on the days of sale and 175 lots to June 30, 1919.

Settlement data of irrigated district, Milk River project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project ¹	101	155	192	217	² 240
Population ¹	210	430	580	688	² 720
Number of irrigated farms ¹	48	64	112	184	² 240
Operated by owners or managers ¹	29	37	77	140	² 200
Operated by tenants ¹	19	27	35	44	² 40
Population ¹	140	193	404	600	² 700
Number of towns ¹	3	5	6	9	10
Population ¹	1,460	4,500	5,000	6,000	7,030
Total population on farms and in towns ¹	1,670	4,930	5,580	6,688	7,750
Number of public schools ¹	6	14	14	18	20
Number of churches ¹	6	14	15	18	18
Number of banks ¹	3	7	10	15	² 23
Total capital stock.....	\$95,000	\$252,000	\$375,000	\$525,000	² \$780,000
Amount of deposits.....	\$600,000	\$1,959,000	\$3,238,000	\$3,219,000	² \$5,279,730
Number of depositors.....	1,800	6,615	9,156	11,640	² 17,600

¹ Exclusive of Chinook and St. Mary's divisions.

² Estimated.

³ Including Chinook division.

PRINCIPAL CROPS.

On the Malta and Glasgow divisions grain occupied 35 per cent, alfalfa 11 per cent, other forage crops 52 per cent, and miscellaneous crops 2 per cent of the area cropped under irrigation in 1918.

178 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Crop report of irrigated lands, Milk River project, Montana, year of 1918.¹

(Exclusive of Chinook division.)

Irrigated crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	2,696	Ton.....	5,843	2.2	\$18.00	\$105,174	\$39.00
Alfalfa seed.....	1	Bushel.....	10	10.0	15.00	150	150.00
Barley.....	307	do.....	4,225	13.8	.65	2,746	8.94
Corn flint.....	59	do.....	898	15.2	1.50	1,347	22.94
Corn fodder.....	18	Ton.....	33	1.9	15.00	495	28.28
Flax.....	623	Bushel.....	1,288	2.1	3.20	4,121	6.61
Garden.....	30	do.....	3	0.02		3,082	104.47
Hay ²	11,432	Ton.....	6,293	0.6	24.00	151,032	13.21
Oats.....	1,374	Bushel.....	28,463	20.7	.65	18,501	13.47
Pasture.....	2,195	do.....				26,340	12.00
Potatoes.....	67	Bushel.....	7,062	105.0	1.20	8,474	125.54
Rye.....	30	do.....	490	15.6	1.30	637	21.23
Wheat.....	4,968	do.....	44,879	9.0	1.93	86,617	17.43
Total cropped acreage.	23,800	Total and average.....				408,718	17.17
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:		Irrigable area farms reported.....			35,758	184	19.7
New alfalfa.....	1,211	Irrigated area farms reported: Under rental contracts.....			24,843	184	13.2
Less duplicated areas.....	168	Cropped area farms reported:					
Total irrigated acreage.	24,843	Irrigated.....			23,800	184	13.2

¹ 108 farms more than 50 per cent irrigated; 76 farms less than 50 per cent irrigated.

² Native blue joint hay, 97 per cent; grain hay, 3 per cent.

Crop report of lands, dry farmed, Milk River project, Montana, year of 1918.¹

(Exclusive of Chinook division.)

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	71	Ton.....	88	1.2	\$18.00	\$1,548	\$21.80
Barley.....	68	Bushel.....	100	1.5	.65	65	.96
Corn fodder.....	5	Ton.....	5	1.0	15.00	75	15.00
Flax.....	51	Bushel.....	166	3.2	3.20	531	10.41
Garden.....	6	do.....	3	0.02		510	85.00
Hay ²	520	Ton.....	334	.6	24.00	8,016	15.41
Oats.....	489	Bushel.....	1,263	2.6	.65	821	1.68
Potatoes.....	4	do.....	700	175.0	1.20	840	210.00
Wheat.....	1,905	do.....	4,774	2.5	1.93	9,213	4.84
Total cropped acreage.	3,119	Total and average.....				21,619	6.93
			Areas.		Acres.	Farms.	Per cent of project.
Fall plowed.....	767	Irrigable area farms reported.....			5,197	33	2.9
Total.....	3,886	Cropped area farms reported.....			3,119	33	1.7

¹ 33 farms dry farmed. The greater part of these crops grown on land inundated by spring floods.

² Native blue joint, 88 per cent; grain hay, 12 per cent.

FINANCIAL STATEMENT.

Condensed balance sheet, Milk River project (exclusive of St. Mary storage unit) to June 30, 1919.

Cash.....		\$2,597.43
Inventory of materials and supplies on hand.....		19,853.74
Accounts receivable.....		2,975.82
Construction work contracted.....		5,160.55
Gross construction cost.....		\$3,384,147.37
Less construction revenue earnings.....	\$76,998.22	
Less cost adjustments.....	138.17	
		76,960.05
Net construction cost.....		3,307,187.32
Accounts payable.....		9,866.42
Contingent obligations.....		7,757.98
Collections and contracts of specific amounts for repayments to reclamation fund.....		27,218.87
Capital investment:		
Disbursement, transfer and joint construction, vouchers received.....	\$3,448,555.50	
Collection transfer, refund and joint construction, vouchers issued.....	155,623.91	
Net investment.....		3,292,931.59

Feature costs of Milk River project (exclusive of St. Mary storage unit).

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Chinook division.....	\$4,357.45	\$55,327.65
Malta division.....	4,258.43	54,070.19
Glasgow division.....	1,287.47	16,346.80
	9,903.35	125,744.64
Storage system:		
Beaver Reservoir.....	1,915.62	1,915.62
Chain Lakes.....	5,476.03	5,476.03
Nelson Reservoir.....	13,278.30	67,457.20
	20,669.95	74,848.85
Canal system:		
Bowdoin.....	51.31	62,748.06
Chinook diversion (from Milk River).....		699.76
Chinook Canals.....	498.20	4,788.86
Dolson diversion.....	38,435.74	354,012.09
Dolson North Canal.....	174.31	278,748.37
Dolson South Canal.....	3,361.20	685,679.09
Nelson Reservoir.....	492.51	124,028.70
Vandalia diversion (from Milk River).....	4,573.83	447,153.69
Vandalia South Canal.....	743.23	407,419.97
	48,240.33	2,295,278.59
Lateral system:		
Bowdoin laterals.....	292.51	62,331.67
Dolson North laterals.....	744.24	113,960.40
Dolson South laterals.....	2,245.89	138,330.88
Nelson Reservoir South laterals.....	21,452.63	224,275.25
Vandalia South laterals.....	1,750.62	114,422.71
	26,455.89	653,320.91
Drainage system:		
Dolson South system.....	68.46	278.99
Nelson Reservoir South.....	833.78	843.18
	902.24	1,062.17
Flood protection:		
Dolson South system.....	2,400.11	36,475.09
Vandalia South system.....		1,432.85
	2,400.11	37,907.94

¹ Contra entry.

180 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Feature costs of Milk River project (exclusive of St. Mary storage unit)—Contd.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Irrigated lands (farm units):		
Bowdoin.....		941.45
Doison North.....		3,756.73
Doison South.....	10.03	8,674.51
Nelson Reservoir South.....	375.14	1,094.27
Vandalia South.....	36.89	1,716.51
	422.06	16,183.47
Permanent improvements:		
Doison Dam.....	9.35	161.49
Wagner operation and maintenance camp.....	10.48	4,303.71
Malta project headquarters, buildings and grounds.....	1,170.75	15,302.34
Saco operation and maintenance camp.....	2,516.52	2,533.77
Paisley operation and maintenance camp.....	1,077.45	2,421.22
	4,784.55	24,722.53
Telephone system:		
Malta.....	1,336.42	5,032.90
Saco.....	6,069.48	6,069.48
Glasgow.....	4,466.17	4,466.17
	10,199.23	15,568.55
Operation and maintenance during construction (water rental).....	33,779.80	120,641.48
Total cost of construction features.....	157,757.51	3,365,269.13
Plant accounts: Undistributed clearing accounts.....		18,878.24
Gross construction cost.....	157,757.51	3,384,147.37
Less revenues earned during construction period:		
Rental of buildings.....	211.09	2,721.32
Rental of grazing and farming lands.....	4,318.18	8,629.80
Rental of irrigation water.....	21,549.55	46,157.71
Contractor's freight refunds.....	1,612.68	18,796.03
Other revenues, unclassified.....	9.92	663.36
Profit on farming operations.....	62.44	62.44
Loss on hospital operations.....	1,808.87	1,100.61
Total.....	24,729.63	76,960.05
Net cost of construction of project (exclusive of St. Mary storage unit).....	133,027.88	3,307,187.32

¹ Contra entry.

² Decrease due to adjustment in this account.

Statement of cost by calendar years, Milk River project (exclusive of St. Mary storage unit).

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending Dec. 31—			
1907.....	\$96,882.22		\$96,882.22
1908.....	105,749.06		105,749.06
1909.....	222,954.92		222,954.92
1910.....	153,767.51		153,767.51
1911.....	66,913.43	\$6,379.82	73,293.25
1912.....	162,820.25	16,957.99	179,778.24
1913.....	761,123.58	13,449.85	774,573.43
1914.....	671,222.04	4,369.62	675,591.66
1915.....	332,483.85	5,789.97	338,273.82
1916.....	245,157.83	9,278.53	254,436.36
1917.....	217,036.13	15,337.13	232,373.26
1918.....	173,838.45	28,533.61	202,372.06
January to June 30, 1919.....	44,678.38	20,544.96	65,223.34
Subtotal.....	3,244,627.65		3,365,269.13
Plant and clearing accounts on June 30, 1919.....	18,878.24		18,878.24
Total.....	3,263,505.89	120,641.48	3,384,147.37

Statement of cost by fiscal years, Milk River project (exclusive of St. Mary storage unit)

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1908.....	\$92,919.05		\$92,919.05
1909.....	193,342.45		193,342.45
1910.....	216,606.81		216,606.81
1911.....	91,413.95	\$2,723.61	94,137.56
1912.....	62,418.44	13,202.49	75,620.93
1913.....	444,475.39	19,720.21	464,195.60
1914.....	713,312.38	3,147.58	716,459.96
1915.....	616,628.95	4,541.08	621,170.03
1916.....	241,813.93	7,680.24	249,494.17
1917.....	239,433.75	10,282.74	249,716.49
1918.....	208,285.84	25,563.73	233,849.57
1919.....	123,977.71	33,779.80	157,757.51
Subtotal.....	3,244,627.65		3,365,269.13
Plant and clearing accounts to June 30, 1919.....	18,878.24		18,878.24
Total.....	3,263,505.89	120,641.48	3,384,147.37

Estimated cost of contemplated work, Milk River project, during fiscal year 1920.

	Sub-feature.	Principal feature.
Examination and surveys:		
Hydrometry.....	\$10,000	
Investigations.....	1,600	
		\$11,600
Storage system:		
Chain Lakes Reservoir.....	3,700	
Nelson Reservoir.....	400	
Beaver Creek Reservoir.....	700	
		4,800
Canal system:		
Diversion dams.....	1,000	
Canals.....	4,200	
Structures.....	4,800	
Equipment.....	1,400	
		11,400
Lateral system:		
Laterals and waste-water ditches.....	36,500	
Structures.....	8,000	
Equipment.....	800	
		45,300
Drainage system surveys.....		3,900
Flood protection.....		200
Farm units.....		1,000
Permanent improvements.....		1,800
Operation and maintenance, water rentals.....		76,500
Reimbursable accounts.....		2,500
Total.....		159,000

Condensed balance sheet, St. Mary storage unit, June 30, 1919.

Inventory of stock on hand.....		\$31,314.71
Undelivered orders.....		319.49
Accounts receivable.....		2,634.34
Gross construction cost.....	\$2,571,327.30	
Less construction revenue earnings.....	29,865.70	
Net construction cost.....		2,541,461.60
Accounts payable.....		12,706.87
Contingent obligations.....		319.49
Capital investment:		
Disbursement, transfer, and joint construction vouchers received.....	2,696,879.42	
Collection, transfer, refund, and joint construction vouchers issued.....	134,175.64	
Net investment.....		2,562,703.78

Feature costs of St. Mary storage unit to June 30, 1919.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$1,768.07	\$52,167.50
Storage system:		
St. Mary Lakes Reservoir, surveying, testing, etc.....		38,797.87
Sherburne Lakes Reservoir, surveying, testing, etc.....	281.40	13,210.92
Sherburne Lakes Dam.....	49,023.26	810,526.76
Sherburne Lakes spillway.....	35,209.92	258,311.23
Sherburne Lakes outlet.....	4,072.90	158,900.54
Sherburne Lakes north hillside slide.....	3,885.47	11,370.48
Sherburne Lakes, Altyn trail.....	3.64	327.59
Sherburne Lakes spillway timber flume.....	215.24	215.24
	93,691.83	791,460.63
Canal system:		
Preliminary and general work.....		133,729.25
St. Mary Canal.....	349.06	741,596.94
Kennedy Creek crossing.....		30,146.47
Diversión dam and headworks.....		51,933.04
Diversión dam, Swiftcurrent Creek.....		84,849.65
Bridges, highways across main canal.....		9,915.59
Control check gate, station 615-20.....		12,885.77
Control check gate, station 91.....	14.79	8,085.30
Drops.....		85,880.66
Kennedy Creek control check and sluice gates.....	17.77	13,727.87
Wasteway sluice gate, station 884.....		11,100.45
Culvert, Powell Creek crossing.....	11.42	7,588.47
Culvert, east of Cow Creek.....		16,443.85
Culvert, Cow Creek.....		5,183.38
Spider Lake Coulee flume.....		39,623.20
Siphon, St. Mary River crossing.....	137.45	115,542.13
Siphon, Halls Coulee crossing.....	13.57	46,044.19
Road, along St. Mary Canal.....	442.72	3,521.21
Kennedy Creek bridge.....	247.77	2,183.55
	1,159.47	1,416,980.97
Flood protection:		
Kennedy Creek dikes.....		18,540.11
Earth dikes, stations 372 and 380.....		1,225.79
		19,765.90
Permanent improvements:		
Road, Browning to St. Mary, camp No. 9.....		45,993.87
Road, Babb to Cardston, Canada.....		5,585.12
Road, Babb to Canadian boundary.....		1,140.92
Road, Babb to Glacier Park boundary.....		46,268.55
Road, St. Mary Challet to Babb, Mont.....		1,676.45
Office building, camp No. 9.....		1,373.65
Cottages (4), camp No. 9.....		3,974.10
Water system, camp No. 9.....		5,319.37
Graveling Swiftcurrent Canyon road.....	5.00	11,723.81
Steel bridge, St. Mary River crossing.....	116.00	34,499.42
Steel bridge, camp No. 2.....	.76	5,723.19
Headquarters' office building (vault).....	1,080.55	1,080.55
Headquarters' cottages (3).....	1,446.04	1,446.04
Headquarters' office, other than vault.....	116.74	116.74
	2,633.09	165,851.78
Telephone system:		
Completed work.....		11,890.90
Line along St. Mary Canal.....	400.35	4,128.46
	400.35	16,019.36
Operation and maintenance, during construction, water-rental basis.....	22,724.11	42,974.21
Total cost of construction features.....	122,376.92	2,505,239.33
Balance in plant accounts.....		52,732.05
Undistributed clearing accounts.....		13,355.90
Gross construction cost to June 30, 1919.....	122,376.92	2,571,327.30
Less revenues earned during construction period:		
Rental of buildings.....	1,547.21	18,112.07
Rental of telephones and tolls.....	2.75	689.15
Contractors' freight refunds.....	116.58	6,793.01
Other revenue, unclassified.....		18.25
Profit on hospital operation.....	249.81	1,453.64
Other profits on operations, unclassified.....	2,463.77	2,799.58
	1,152.54	29,815.70
Net cost of construction of project, to June 30, 1919.....	121,224.38	2,541,461.60

¹ Deduct.

NOTE.—No work actually done on canal system; on graveling Swiftcurrent Canyon road, steel bridge—St. Mary River crossing, steel bridge—camp No. 2, under permanent improvements; nor on telephone system. Cost for year represents cost adjustments only.

Cost statement, by calendar years, St. Mary storage unit.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending Dec. 31—			
1908.....	\$197,453.33		\$197,453.33
1909.....	20,578.27		20,578.27
1910.....	28,833.89		28,833.89
1911.....	20,652.46		20,652.46
1912.....	138,141.53		138,141.53
1913.....	210,408.71		210,408.71
1914.....	544,384.54		544,384.54
1915.....	738,554.09		738,554.09
1916.....	206,227.42	\$3,371.75	209,599.17
1917.....	218,759.02	12,914.11	231,673.13
1918.....	117,111.65	17,152.30	134,263.95
January to June 30, 1919.....	21,150.23	9,536.05	30,686.28
Subtotal.....	2,462,265.14		2,505,239.35
Plant accounts.....	52,732.05		52,732.05
Clearing accounts.....	13,355.90		13,355.90
Total.....	2,528,353.09	42,974.21	2,571,327.30

Cost statement, by fiscal years, St. Mary storage unit.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1908.....	\$172,596.63		\$172,596.63
1909.....	32,143.75		32,143.75
1910.....	26,369.09		26,369.09
1911.....	25,178.79		25,178.79
1912.....	30,424.90		30,424.90
1913.....	176,585.45		176,585.45
1914.....	296,911.39		296,911.39
1915.....	808,273.43		808,273.43
1916.....	496,831.86	\$15,960.32	512,792.18
1917.....	193,433.59	18,543.83	211,977.42
1918.....	193,857.45	12,833.61	206,691.06
1919.....	99,652.81	22,724.11	122,376.92
Subtotal.....	2,462,265.14		2,505,239.35
Plant accounts.....	52,732.05		52,732.05
Clearing accounts.....	13,355.90		13,355.90
Total.....	2,528,353.09	42,974.21	2,571,327.30

¹ Deduct.*Estimated cost of contemplated work, St. Mary storage unit, during fiscal year 1920.*

	Sub-feature.	Principal feature.
Examination and surveys.....		\$1,600
Storage system: Sherburne Lakes dam and reservoir.....		6,500
Canal system:		
Spider P'ou'ee flume.....	\$25,000	
Removal of slides and leakage prevention.....	28,500	
Permanent improvements.....		53,500
Operation and maintenance, water rentals.....		1,000
Reimbursable accounts.....		12,000
		400
Total.....		75,000

MONTANA, SUN RIVER PROJECT.

GEO. O. SANFORD, project manager, Fort Shaw, Mont.

LOCATION.

Counties: Cascade, Chouteau, Lewis and Clark, Teton.
Townships: 20 to 25 N., Rs. 6 E. to 8 W., Montana meridian.
Railroads: Chicago, Milwaukee & St. Paul; Great Northern.
Railroad stations and estimated population June 30, 1919: Ashuelot;¹ Bole, 70; Cordova;¹ Dracut;¹ Fairfield, 150; Fort Shaw, 50; Gilman, 200; Power, 100; Riebling;¹ Simms, 150; Sloan;¹ Sun River, 65; Vaughn.¹

WATER SUPPLY.

Source of water supply: Sun River and tributaries, Deep Creek, Bowl Creek, and Basin Creek.

Area of drainage basins: Sun River, 1,070 square miles; Deep Creek, 260 square miles; Bowl Creek, 9 square miles; Basin Creek, 15 square miles.

Annual run-off in acre-feet: North Fork of Sun River, near Augusta, 1905-1915, and at Sun River Diversion Dam, 1916-1918, maximum, 1,127,400; minimum, 375,700; mean, 679,400. Willow Creek, near Augusta, 1906-1918, maximum, 42,460; minimum, 8,070; mean, 23,000. Sun River, at Sun River, 1905-1912, and at Fort Shaw, 1913-1918, maximum, 1,289,000; minimum, 429,550; mean, 911,200. South Fork of Sun River, near Augusta, 1905-1918, maximum, 159,735; minimum, 28,027; mean, 83,600.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to supply water season of 1919: 40,057 acres.

Area under water-right application season of 1919: 11,933 acres.

Area under rental contracts season of 1918: 12,580 acres.

Area having vested water rights: 145.3 acres.

Length of irrigation season, May 1-October 10: 163 days.

Average elevation of irrigable area: 3,700 feet above sea level.

Rainfall on irrigable area: For 31 years, average 11.05 inches; 1918, 7.07 inches.

Range of temperature on irrigable area: -40° to 100° F.

Character of soil of irrigable area: Sandy loam, clay, adobe, and alluvium.

Principal products: Hay, grain, vegetables, live stock, and dairy products.

Principal markets: Great Falls, Seattle, St. Paul, Minneapolis, and Chicago.

LANDS OPENED FOR IRRIGATION.

Dates of public notices: March 26, 1908; November 19, 1910; March 28, 1911; March 2 and July 13, 1912; June 23, 1913; September 24, 1914; March 20 and March 26, 1915; January 15, 1916; March 14, 1917; March 22, 1918; and April 29, 1919.

Location of lands opened: Tps. 20 and 21 N., Rs. 1 to 3 W., Montana meridian.

Limit of area of farm units: 160 acres.

Duty of water: 2 acre-feet per acre at the farm.

Building charge per acre of irrigable land: \$30 to \$36.

Annual operation and maintenance charge: For the irrigation years 1918 and 1919, \$1.70 per acre of irrigable land, entitling the water user to 1½ acre-feet of water per irrigable acre, with an additional charge of 50 cents for each additional foot of water used.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1905.

Construction recommended by board of engineers February 13, 1906.

Construction authorized by Secretary February 26, 1906.

Fort Shaw Main Canal completed July, 1908.

First irrigation by Reclamation Service season of 1909.

Fort Shaw unit completed December, 1909.

Willow Creek Dam completed, present development November 7, 1911.

Sun River Diversion Dam completed March, 1915.

First irrigation of north side lands season of 1919.

Entire project 44.2 per cent completed June 30, 1919:

¹ Less than 25

IRRIGATION PLAN.

The irrigation plan of the Sun River project, so far approved, provides for the storage of water in Sun River storage reservoir on the North Fork of Sun River, in the Willow Creek Reservoir on Willow Creek, and in Pishkun Reservoir north of Sun River; the diversion of water from the North Fork of Sun River through a supply canal for the Pishkun Reservoir; the diversion of water from Sun River, supplemented by stored waters released from Sun River storage and Willow Creek Reservoir, into a canal system watering lands mainly in the abandoned Fort Shaw Military Reservation; and the diversion of water from Pishkun Reservoir into the Sun River Slope Canal, supplying water for lands on the north side of Sun River.

Possible future development may include the diversion of water from Bowl and Basin Creeks, tributaries of Flathead River, across the Continental Divide to Sun River drainage; the diversion of water from the North Fork of Sun River into a supply canal for Willow Creek Reservoir; the diversion of flood waters from Deep Creek into Pishkun Reservoir; the construction of a reservoir on Muddy Creek and of a canal system leading therefrom for the irrigation of lands lying on the north side of Sun River in the vicinity of Vaughn and Manchester; the storage of water in Benton Lake Reservoir for the irrigation of lands lying north of Great Falls; and the diversion of water from the Sun River for the irrigation of lands lying west of Great Falls.

The United States claims all waste, seepage, unappropriated, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The Fort Shaw division and the Willow Creek Reservoir (first development 16,640 acre-feet) have been completed. The Pishkun Canal (first development of 1,000 second-feet) and the Sun River Slope Canal (first development of 500 second-feet) have been completed, but require further puddling to prevent leakage. The Greenfields Canal (first development 500 second-feet) has been completed except the lining with concrete of about 900 linear feet. The Greenfields South and Mill Coulee Canals have been excavated. The lateral system for about 25,000 acres in the first unit of the Greenfields division has been completed, but requires the addition of structures and minor lateral extensions to provide deliveries to unentered public, private, and State lands.

SUMMARY OF GENERAL DATA FOR SUN RIVER PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	174,620
Public land entered to June 30, 1919.....	55,641
Public land open to entry on June 30, 1919.....	437
Public land withdrawn on June 30, 1919.....	39,626
State land June 30, 1919.....	12,034
Railroad land June 30, 1919.....	260
Private land June 30, 1919.....	66,622
<hr/>	
Acreage service could have supplied in season of 1919.....	40,057
Estimated acreage service can supply in season of 1920.....	40,057
Acreage irrigated season of 1918.....	7,569
Acreage cropped under irrigation season of 1918 ¹	7,832
Acreage dry farmed season of 1918.....	109

Crops:

Value of irrigated crops season of 1918.....	\$245,852.00
Value of irrigated crops per acre cropped.....	\$31.39
Value of dry farmed crops season of 1918.....	\$1,998.48
Value of dry farmed crops per acre cropped.....	\$18.33

Finances:

Net construction cost to June 30, 1919.....	\$3,729,074.91
Per cent completed on June 30, 1919.....	44.2
Appropriated for fiscal year 1920.....	\$141,000.00
Estimated per cent complete by June 30, 1920.....	46.0
Proposed appropriation for fiscal year 1921.....	148,000
Estimated per cent complete by June 30, 1921.....	47.5
Announced construction charges per acre.....	\$30 and \$36

¹ Acreage cropped on 187 farms using water, season of 1918, of which 7,558 acres were irrigated; 11 acres were irrigated other than farms, making a total of 7,569 acres irrigated on project. Value of crops on above 187 farms is on a cropped area of 7,832 acres.

Finances—Continued.

Appropriation fiscal year 1919.....	\$222,000.00	
Carried over from fiscal year 1916 appropriation.....	100,000.00	
Increase under 10 per cent provision.....	22,200.00	
Increase miscellaneous collections.....	12,241.85	
Special appropriation.....	467.12	
Appropriation for increased compensation.....	14,480.45	
		<u>\$371,389.42</u>
Expenditures chargeable to 1919 appropriation:		
Disbursements.....	296,959.19	
Transfers.....	29,958.09	
Current liabilities.....	25,827.60	
Contingent liabilities.....	975.10	
		<u>353,719.98</u>
Unencumbered balance on July 1, 1919.....		17,669.44
Repayments:		
Value of construction water-right contracts.....		<u>395,799.35</u>
Construction charges:		
Accrued to June 30, 1919.....		115,328.60
Collected to June 30, 1919.....		111,951.14
		<u>3,377.46</u>
Operation and maintenance charges (public notice):		
Accrued to June 30, 1919.....		81,391.94
Collected to June 30, 1919.....		75,509.14
		<u>5,882.80</u>
Water-rental charges:		
Accrued to June 30, 1919.....		1,478.50
Collected to June 30, 1919.....		1,223.50
		<u>255.00</u>
Drainage: Estimated acreage damaged by seepage to June 30, 1919...		22.50

CONSTRUCTION DURING FISCAL YEAR.

At the beginning of the fiscal year work was in progress on the securing and delivery of gravel and sand for the concrete lining of the Greenfields Canal and on the completion by Government forces of the construction of structures in the Greenfields division under suspended contract No. 649.

North Side Canal system.—Immediately after the beginning of the fiscal year when funds became available, active work on the concrete lining of portions of the Greenfields Canal was commenced. Poor progress was made during the first half of the fiscal year, due to the inability to secure a sufficient supply of labor. During the latter part of the fiscal year labor conditions as regards supply and quality were somewhat improved, and the work was completed in May, 1919. On account of lack of sufficient funds about 500 linear feet of canal lining were temporarily eliminated, but developments after water was turned into the canal made it apparent that not only would this section require lining as soon as conditions will permit, but that it will have to be extended to cover about 900 linear feet.

The priming and puddling of the North Side Canal system and construction of operation road were continued with what funds were available. The limited amount of water that could be run in the

canal prior to the completion of the concrete lining of the Greenfields Canal was not sufficient to render sluicing for puddling purposes practicable, so this work was discontinued. The construction of operation roads was continued at intermittent intervals as a force became available.

Work on the construction of structures to permit the utilization of Elbow Coulee as a wasteway channel was begun early in the fiscal year but on account of the shortage of labor the progress made was very poor. In the spring of 1919 the work was resumed, but on account of the necessity of reducing expenditures was discontinued before much was accomplished.

Lateral system.—Work on the completion by Government forces of suspended contract No. 649 was continued and was completed in December, 1918, although the accounts of the contractor have not yet been settled. The completion of this work permits the delivery of water to the lands in the first unit of the Greenfields division.

Permanent improvements.—A contract was let to Chapman & Wilkinson, of Simms, Mont., for the erection of a cottage, office, lodging house, garage, and stable at Fairfield, Mont., to serve as operation and maintenance headquarters for the Greenfields division. At the close of the fiscal year about 70 per cent of the work covered by the contract had been completed.

SEEPAGE AND DRAINAGE.

About 13 per cent of the 14,920 acres in the Fort Shaw division is affected by seepage or alkali.

No action has been taken by the farmers leading to the drainage of the affected areas.

OPERATION AND MAINTENANCE.

The absence of the usual spring rains resulted in a heavy demand for irrigation water in 1918. The water supply in Sun River was sufficient, although the river reached a very low stage early in the month of August. The rainfall during the irrigation season was about 6 inches, which is 1 inch less than that of 1917 and very much lower than that of any other season since the project was opened. No serious trouble was encountered in operation. The total amount of water diverted during the season was 30,087 acre-feet, of which 11,193 acre-feet were delivered to the land; 46 per cent of this amount was delivered during the month of June, and about 17 per cent in August. The duty of water was 1.48 acre-feet per acre. The operation and maintenance charge was \$1.70 per irrigable acre whether water was used or not, entitling the user to 1½ acre-feet per irrigable acre. Additional water was furnished for 50 cents per acre foot.

Irrigation on the Fort Shaw division in the spring of 1919 began April 26 and continued with little interruption. A break in the main canal at about mile 8 caused by burrowing animals occurred early in May and delayed deliveries to the lower end of the system. As there was an absence of the usual spring rains in May and June the demand for irrigation water was unusually heavy. A sudden drop in Sun River about June 23 made it necessary to cut through a gravel bar which had formed in front of the Fort Shaw canal headworks before a sufficient head of water could be diverted into the canal. At the

close of the fiscal year the flow of Sun River had become so low as to render dubious the outlook for a sufficient water supply for the remainder of the irrigation season.

Irrigation began on the first unit of the Greenfields division on June 6, 1919. A maximum quantity of 154 second-feet was delivered to the head of the lateral system. Farmers that were in shape to handle water were scattered over the bench, a few being located on each lateral. To make deliveries to those requesting water necessitated running a small head of water in all the main laterals, resulting in heavy losses. The laterals on the west end of the bench showed the heaviest loss through seepage; those on the lower end held comparatively well. Russian thistles blowing into the ditches and trash coming down the canal from above interfered with deliveries. As a rule, the farmers' head ditches and field laterals were found to be too small for adequate irrigation heads. On the Greenfields division 2,379 acre-feet of water were delivered to users and 2,764 acres were irrigated.

The following table shows the maximum storage and water surface elevations in Willow Creek Reservoir during the irrigation seasons the past five years, 1918 included:

Year.	Capacity.	Maximum storage.	Elevation of water surface.
	<i>Acre-feet.</i>	<i>Acre-feet.</i>	
1914.....	16,700	15,103	4,128.9
1915.....	16,700	16,000	4,129.15
1916.....	16,700	19,000	4,132.5
1917.....	16,700	11,545	4,124.5
1918.....	16,700	8,042	4,119.5

There was a very light run-off in Willow Creek watershed in 1918. No water was drawn from the reservoir from May 3 to August 1, yet the storage had only increased from 1,900 acre-feet to 8,042 acre-feet, which was approximately the amount impounded at the close of the year. No storage water was used for irrigation.

In 1918 maintenance work on the Fort Shaw division consisted of cleaning laterals, replacing worn-out structures, installing structures for deliveries to new units, and constructing log cribs in Sun River for the protection of the Fort Shaw Canal headworks. A labor shortage delayed the prosecution of work early in the spring. The weather was excellent, but the necessity of using the laterals early in the season prevented cleaning laterals to the extent planned. Good progress, however, was made in replacing old and installing new structures.

On the Greenfields division a maintenance camp was established early in the season. Silt and weeds which had blown during the winter completely filled long stretches of laterals. One crew worked continuously during the spring and early summer removing this material; another crew was employed about two months burning Russian thistles.

Historical review, Sun River project.

Item.	1913	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	16,346	16,346	16,346	16,322	16,224	14,978	40,057
Acreage irrigated.....	7,419	6,613	4,261	\$ 4,717	\$ 6,675	\$ 7,589	9,628
Miles of canal operated.....	121	110	100	100	100	96	244
Water diverted (acre-feet).....	27,566	24,762	15,538	17,841	25,841	30,087	32,946
Water delivered to land (acre-feet).....	11,187	11,468	4,653	\$ 5,757	\$ 9,091	\$ 11,193	\$ 13,782
Per acre of land irrigated (acre-feet).....	1.5	1.73	1.1	1.22	1.36	1.48	1.43

¹ To June 3).² Includes 10 acres irrigated other than farms.³ Includes 20 acres irrigated other than farms.⁴ 11.25 acres irrigated other than farms.⁵ Includes 32 acre-feet delivered to town sites, etc.⁶ Includes 65 acre-feet delivered to town sites, etc.⁷ 51.1 acre-feet delivered to United States reserves, etc.⁸ 1,479 acre-feet delivered to canal of Flowerree Sheep & Horse Co.**SETTLEMENT.**

Fair crops and good prices have encouraged the farmers on the Fort Shaw division. As a rule, they are using better methods in handling their land and the matter of good seed is being given more attention. Dairy farming, which has developed during the past two years, is one of the principal sources of income.

Land values have increased very materially and good irrigable land is strongly in demand. Sales ranging from \$100 to \$125 per acre were made with a limited amount of land on the market. Good alfalfa land not thoroughly developed can be bought at lower prices.

On June 13, 1919, a decree was issued by the court forming the Fort Shaw irrigation district.

Settlement data, Fort Shaw unit, Sun River project.¹

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	199	270	265	254	239	\$ 245
Population.....	523	590	\$ 600	\$ 640	600	\$ 610
Number of irrigated farms.....	172	200	158	176	187	\$ 192
Operated by owner or managers.....	159	126	103	120	118	\$ 122
Operated by tenants.....	13	74	55	56	69	\$ 70
Population.....	480	565	436	476	508	\$ 520
Number of towns.....	3	3	3	3	3	3
Population.....	203	173	179	168	158	\$ 150
Total population in towns and on farms...	726	763	779	808	758	\$ 760
Number of public schools.....	4	4	4	4	4	4
Number of churches.....	3	3	3	4	4	4
Number of banks.....	1	1	1	1	1	1
Total capital stock.....	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
Amount of deposits.....	\$44,000	\$44,000	\$85,000	\$95,000	\$98,000	\$ 110,000
Number of depositors.....	300	280	310	390	390	\$ 400
Number of relinquishments.....	3	6	4	1	3	\$ 4
Number of cancellations.....	5	3	2	0	0	0
Homestead entries.....	4	13	5	5	8	\$ 6

¹ Does not include first unit of Greenfields division placed under irrigation in June, 1919.² Estimated.**PRINCIPAL CROPS.**

Alfalfa on the Fort Shaw division in 1918 comprised about 47½ per cent of the cropped area and about 56 per cent of the value of all crops raised. The average yield per acre for the irrigated alfalfa was 1.82 tons compared to 1.7 tons in 1917 and 1.63 tons in 1916. Wheat, the second crop of importance, amounted to 27 per cent of the cropped acreage and 24 per cent of the total crop value. The season was unfavorable for grain production; prevailing hot weather

at the time the wheat was stooling and a blight which struck a number of fields were factors that account for the low yields. There was an increase in the acreage seeded to oats and a slight increase in the yield per acre. The potato acreage decreased about 40 per cent over that of 1917. Dry rot injured the early seeding and the stand was poor. The potato market was very unfavorable for the growers. The total value of all crops raised on the Fort Shaw division in 1918 was \$247,850.73 compared to \$226,450 in 1917. The average yield for units using water was \$31.39 and for units farmed dry, \$18.33.

The spring of 1919 was very dry. All grain crops had to be irrigated up. Aside from a few fields, the outlook for average grain yields is not promising. The first cutting of alfalfa hay on the Fort Shaw division was unusually heavy and the quality is excellent. The hay crop is about 10 days in advance of most seasons, which indicates that a third cutting may be secured.

On the Greenfields bench the extremely dry season resulted in a very uneven and poor stand of grain. Cutworms began to work on the grain early in the season and Russian thistles came up very thick in the fields, sapping the ground and crowding out the plants. As soon as water was available some of the best of the early wheat was irrigated, but the grain had little vitality and failed to respond to the application of water. A few fields of late grain that have been irrigated are looking fine and a small acreage of flax gives promise of a fair yield. Alfalfa that was seeded in the spring and given proper irrigation is in good condition.

Prices for farm products in 1918 ranged about the same as in 1917.

Crop report for farm units using water, Sun River project, Montana (Fort Shaw division), year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa.....	3,766	Ton.....	6,924.1	1.84	\$20.00	\$139,081	\$36.91	
Alfalfa seed.....	51	Bushel.....	218.5	4.28	12.00	2,622	51.41	
Barley.....	39	do.....	986.5	25.46	1.20	1,184	30.55	
Beans.....	1	do.....	20.33	16.11	9.00	183	146.40	
Clover hay.....	15	Ton.....	15	1	20.00	300	20.00	
Clover seed.....	37	Bushel.....	174	4.7	15.00	2,610	70.54	
Corn.....	11	do.....	120	10.9	2.00	240	21.80	
Flax.....	35	do.....	121	3.46	3.00	363	10.37	
Fruits, small.....		Pound.....	310	1,033.3	.50	155	516.67	
Garden.....	47	Acre.....				6,533	138.08	
Hay, except alfalfa.....	194	Ton.....	183	.94	17.00	3,114	16.05	
Oats.....	514	Bushel.....	13,247.14	25.77	.99	13,135	25.55	
Pasture.....	881	Acre.....			7.60	6,695	7.60	
Potatoes.....	116	Bushel.....	17,574.00	151.07	.60	10,754	92.47	
Wheat.....	2,118	do.....	30,622.85	14.46	1.90	58,183	27.46	
Sunflowers.....	7	Ton.....	70	70	10.00	700	100.00	
Total cropped acreage.....	7,832		Total and average.....			245,852	31.39	
Number of acres irrigated on 187 farms.....	7,558		Areas.		Acres.	Farms.	Per cent of project.	
Total irrigated acreage.....	7,569		Total irrigable area farms reported..		10,566	187	70.54	
			Total irrigable area farms reported, less seep, etc.		9,136	187	60.93	
			Total irrigated area farms reported:					
			Under water-right applications.....		7,332	180	48.95	
			Under rental contracts¹.....		108	4	.72	
			Under vested rights.....		117	3	.78	
			Total cropped area farms reported..		7,832	.....	52.28	

¹ Includes 24-acre tract at Fort Shaw headquarters.

Crop report for farm units farmed "dry," Sun River project, Montana (Fort Shaw division), year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Barley.....	15	Bushel....	300	20	\$1.20	\$360	\$24.00
Garden.....	1.25	Acre.....				175	140.00
Hay.....	21	Ton.....	21	1	15.00	315	15.00
Oats.....	5	Bushel....	150	30	1.00	150	30.00
Pasture.....	38	Acre.....				351	9.23
Potatoes.....	.75	Bushel....	100	133.33	.60	60	80.00
Wheat.....	28	do.....	309.2	11.04	1.90	587	20.98
Total cropped.....	109	Total and average.....				1,998	18.33
			Areas.		Acres.	Number of farms.	Per cent of project.
			Total irrigable area farms reported, dry.....		154	7	1.03
			Total irrigable area farms reported, less seep, etc.....		102	7	.68
			Total cropped area farms reported.....		109		.73

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, APRIL 29, 1919.

1. **Land for which water will be furnished.**—In pursuance of the provisions of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that upon proper application being made therefor water will be furnished under the Fort Shaw division of the Sun River project, Montana, in the irrigation season of 1919 and thereafter for the irrigable land in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, or farm unit M, sec. 13, T. 20 N., R. 3 W., Montana principal meridian, shown on diagram approved March 23, 1918, by the Director of the Reclamation Service, amendatory of farm unit plat of said township approved by the Secretary of the Interior, March 23, 1918. Copies of the amendatory diagram and township plat are on file at the office of the project manager, United States Reclamation Service, at Fort Shaw, Mont., and at the local land office at Great Falls, Mont.

2. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

3. **Construction charge.**—The construction charge shall be \$50 per acre of irrigable land. Five per cent of the construction charge shall be paid at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent

installments shall become due and payable on December 1 of each calendar year thereafter.

4. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice shall be of the same amount as for other like lands under the said division and project. Such charge will be due and payable on March 1 of each year for the preceding irrigation season

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Sun River project, June 30, 1919.

Cash.....		\$2,525.17
Inventory of materials and supplies on hand.....		41,540.66
Accounts receivable:		
Current accounts receivable.....		21,857.57
Construction water-right charges unaccrued.....		280,470.75
Construction work contracted.....		39,564.30
Gross construction cost.....	\$3,775,065.92	
Less construction revenue earnings.....	46,021.01	
Net construction cost.....		3,729,074.91
Gross operation and maintenance cost.....	128,414.68	
Less operation and maintenance revenue earnings.....	446.55	
		127,968.13
Accounts payable.....		18,985.17
Contingent obligations.....		42,076.81
Collections and contracts of specific amounts for repayments to reclamation fund.....		516,561.08
Miscellaneous accruals.....		15,817.80
Capital investment:		
Disbursements and transfer and joint construction vouchers received.....	4,040,415.07	
Less collections, refunds and transfer, and joint construction vouchers issued.....	390,854.44	
Net investment.....		3,649,560.63

Feature costs of Sun River project to June 30, 1919.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Investigation and surveys.....	\$841.99	\$52,217.25
Experimental flumes.....	15.93	607.13
Experimental measuring devices.....	2.67	227.69
Experimental concrete pipe and blocks.....	13.32	108.08
	873.91	53,160.15
Storage works:		
Willow Creek Reservoir Dam and outlet work.....	582.45	282,831.91
Warm Springs Reservoir (site).....		31,796.93
Beaver Creek Reservoir (site).....	486.76	26,329.86
Pishkun Reservoir.....	1.33	35,962.86
Muddy Creek Reservoir.....		736.42
Benton Lake Reservoir.....		1,713.59
	97.02	379,371.57
Canal system:		
Fort Shaw Canal.....	160.00	233,363.52
Pishkun Canal.....	8,457.10	1,225,305.17
Sun River Slope Canal.....	52,359.61	663,343.94
Greenfields main canal.....	128,221.15	304,351.71
Teton Canal.....		19,719.76
Greenfields Lake Canal.....	109.54	472.76
Sunnyside Canal.....		1,732.09
	189,307.40	2,448,238.95

Feature costs of Sun River project to June 30, 1919—Continued.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Lateral system:		
Fort Shaw division		\$206,362.21
Sun River Slope division		1,379.61
Greenfields division	\$122,247.55	497,347.22
Mill Coulee division		12,549.61
Teton division		454.17
	122,247.55	718,062.82
Farm units:		
Fort Shaw division		3,198.30
Greenfields division	2,048.29	16,100.48
	2,048.29	19,298.78
Permanent improvements:		
Buildings—		
Simms		1,515.16
Gilman	25 17	2,200.77
Willow Creek		888.42
Sun River diversion		1,306.41
Camp No. 9		1,801.80
Camp No. 11		1,607.32
Camp No. 12		1,748.66
Camp No. 13 (Fairfield)	7,588.50	9,209.08
Camp No. 14		1,733.51
Bridge across Sun River at Fort Shaw		634.09
Roads:		
Gilman to Sun River diversion	1 998.93	9,405.62
Sun River diversion to Warm Springs		18,518.97
	6,614.74	50,569.81
Telephone system:		
Great Falls to Willow Creek		7,474.70
Willow Creek to Warm Springs		4,138.67
Willow Creek cut-off to North Side line	1.75	415.49
Sun River diversion to Greenfields main canal, station 225		7,170.34
Greenfields main canal, station 225, to Fort Shaw		3,412.70
Greenfields division local lines	91.43	6,437.50
	93.18	29,049.40
Operation and maintenance during construction	15,497.48	15,497.48
Operation and maintenance charges transferred to and added to construction charges	1 160.00	2,518.90
Gross cost of construction features	336,619.57	3,715,847.96
Balance in unadjusted clearing accounts		1 3,292.72
Balance in plant accounts		62,540.78
Gross construction cost	336,619.57	3,775,065.92
Less revenues earned during construction season:		
Rentals of buildings	678.17	15,067.48
Rentals of grazing and farm lands	10,432.21	10,432.21
Rentals of telephone and tolls	2.95	321.50
Contractors' freight refunds		18,253.85
Other revenues, unclassified	302.93	305.43
Profit on hospital operations	239.07	1,640.54
	11,655.33	46,021.01
Net construction cost, June 30, 1919	324,964.24	3,729,074.91

¹ Deduct.

Statement of cost by calendar years, Sun River project.

	Construc- tion.	Operation and maintenance.			Total cost.
		During con- struction.	Under pub- lic notice.	Total.	
Year ending Dec. 31—					
1902.....	\$617.52				\$617.52
1903.....	2,022.96				2,022.96
1904.....	11,543.66				11,543.66
1905.....	34,821.28				34,821.28
1906.....	20,824.18				20,824.18
1907.....	241,530.67				241,530.67
1908.....	81,108.04		\$8,980.75	\$8,980.75	90,088.79
1909.....	56,344.93		14,471.51	14,471.51	70,816.44
1910.....	148,541.21		9,413.27	9,413.27	157,954.48
1911.....	100,157.42		6,849.71	6,849.71	107,007.13
1912.....	211,855.71		9,762.99	9,762.99	221,618.70
1913.....	232,342.46		12,517.66	12,517.66	244,860.12
1914.....	907,346.92		11,060.87	11,060.87	918,407.79
1915.....	851,322.27		6,926.24	6,926.24	858,248.51
1916.....	258,542.27		13,262.25	13,262.25	271,804.52
1917.....	137,287.23		8,262.56	8,262.56	145,549.79
1918.....	359,125.93		16,252.73	16,252.73	375,378.66
January to June 30, 1919.....	45,015.72	\$15,497.48	9,208.26	24,705.74	69,721.46
Subtotal.....	3,700,350.38	15,497.48	126,918.80	142,416.28	3,842,766.66
Plant.....	62,540.78				62,540.78
Undistributed clearing accounts.....	1 3,292.72		1,496.88	1,496.88	1 1,796.84
Total.....	3,759,598.44	15,497.48	128,414.68	143,912.16	3,903,510.60

¹ Deduct.

NOTE.—Differences from previous reports in amounts shown due to change in method for handling plant and undistributed clearing accounts.

Statement of cost by fiscal years, Sun River project.

	Construc- tion.	Operation and maintenance.			Total cost.
		During con- struction.	Under pub- lic notice.	Total.	
Year ending June 30—					
1903.....	\$622.52				\$622.52
1904.....	2,281.04				2,281.04
1905.....	29,205.07				29,205.07
1906.....	26,466.71				26,466.71
1907.....	94,159.97				94,159.97
1908.....	210,165.72				210,165.72
1909.....	44,331.02		\$21,275.23	\$21,275.23	65,606.25
1910.....	79,794.09		11,188.34	11,188.34	90,982.43
1911.....	156,749.52		4,063.00	4,063.00	160,812.52
1912.....	69,091.12		5,855.26	5,855.26	74,946.38
1913.....	274,344.16		13,997.50	13,997.50	288,341.66
1914.....	555,879.09		11,188.54	11,188.54	567,067.63
1915.....	906,948.10		8,731.53	8,731.53	915,679.63
1916.....	602,097.84		9,882.00	9,882.00	611,979.84
1917.....	144,732.64		10,308.97	10,308.97	155,041.61
1918.....	132,359.68		15,674.68	15,674.68	198,034.36
1919.....	321,122.09	\$15,497.48	14,753.70	30,251.18	351,373.27
Subtotal.....	3,700,350.38	15,497.48	126,918.80	142,416.28	3,842,766.66
Plant.....	62,540.78				62,540.78
Undistributed clearing accounts.....	1 3,292.72		1,496.88	1,496.88	1 1,796.84
Total.....	3,759,598.44	15,497.48	128,414.68	143,912.16	3,903,510.60

¹ Deduct.

NOTE.—Differences from previous reports in amounts shown due to change in method for handling plant and undistributed clearing accounts.

MONTANA-NORTH DAKOTA, LOWER YELLOWSTONE PROJECT. 195

Estimated cost of contemplated work, Sun River project, during fiscal year 1920.

Principal features.	Sub-feature.	Principal feature.
Examination and surveys:		
General.....	\$1,300	
Experimental investigations.....	200	\$1,500
Canal system:		
Fishkum Canal.....	2,500	
Sun River Slope Canal.....	10,400	
Greenfields Canal.....	13,500	
Final payment due Great Falls Power Co.....	39,000	65,400
Lateral system: Greenfields division, first unit (laterals and structures).....	24,500	24,500
Permanent improvements and land: Fairfield operation headquarters.....		4,500
Telephone system: Willow Creek cut-off.....		600
Operation and maintenance:		
Water-rental basis.....	31,500	
Public notice.....	13,000	44,500
Total.....		141,000

Operating cost and revenues, Sun River project, to Dec. 31, 1918.

Features.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage works, Willow Creek Reservoir ¹	\$1,026.92	\$420.03	\$1,446.95	\$3,380.09	\$1,756.60	\$5,136.69
Canal system: Fort Shaw Main Canal.....	1,971.84	4,765.15	6,736.99	9,315.71	25,821.33	35,137.04
Lateral system:						
Lateral A.....	1,151.65	847.75	1,999.40	6,962.27	19,126.96	26,089.23
Lateral C.....	805.75	1,549.58	2,355.33	4,466.37	14,136.16	18,602.53
Lateral D.....	1,106.53	2,407.97	3,514.50	6,751.13	9,248.90	16,000.03
Laterals K and H.....	631.06	1,569.74	2,200.80	4,214.20	15,209.72	19,423.92
Total lateral system.....	3,694.99	6,375.04	10,070.03	22,393.97	57,721.74	80,115.71
Subtotal.....	4,639.91	11,560.22	16,200.13	35,089.77	85,299.67	120,389.44
Operation and maintenance charges transferred to and added to construction charges.....			52.60			\$ 2,678.90
Total cost.....			16,252.73			117,710.54
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			17,063.74			81,391.94
Operation and maintenance charges paid in advance by water-right applicants.....			84.39			210.29
Operation and maintenance charges paid and forfeited by water-right applicants.....			141.00			1,155.09
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			253.66			383.52
Rentals of irrigation water.....			518.86			1,109.45
Other revenues unclassified, earned during operating period.....						67.23
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			\$ 341.34			\$ 896.84
Less loss on farming operations.....			\$ 737.22			\$ 737.22
Total revenues.....			16,983.09			82,683.46
Excess or deficit.....			730.36			35,027.08

² Deduct.

¹ Credit shown is due to transferring from costs of operation and maintenance under public notice to operation and maintenance during construction, portion of costs, \$2,663.39, incurred during 1917 and 1918 for guarding Willow Creek Dam. Actual cost, \$1,636.47.

MONTANA-NORTH DAKOTA, LOWER YELLOWSTONE PROJECT.

L. H. MITCHELL, project manager, Savage, Mont.

LOCATION.

Counties: Richland and Dawson, Mont.; McKenzie, N. Dak.

Townships: 18 to 26 N., Rs. 56 to 60 E., Montana meridian; 150 to 152 N., R. 104 W., fifth principal meridian.

Railroads: Northern Pacific, Great Northern, and Missouri River.

Railroad stations and estimated population June 30, 1919: Intake, 90; Burns, 25; Savage, 325; Crane, 40; Sidney, 1,800; and Fairview, Mont., 1,000; Dore, N. Dak., 30.

WATER SUPPLY.

Source of water supply: Yellowstone River.

Area of drainage basin: 66,000 square miles.

Annual run-off in acre-feet: Yellowstone River at Intake, Mont., 1918, 12,590,000; maximum since 1909, 14,130,000; minimum since 1909, 8,900,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to deliver water, season of 1919: 42,167 acres.

Area under rental contracts, season of 1919: 31,800 to June 30.

Length of irrigating season: May 1 to October 10—163 days.

Average elevation of irrigable area: 1,900 feet.

Rainfall on irrigable area: 13-year average, 15.41 inches; 1918, 13.60 inches.

Range of temperature on irrigable area: -46° to 110° F.

Character of soil of irrigable area: Deep sandy loam predominates, some alkali and gumbo.

Principal products: Grain, forage crops, and vegetables.

Principal markets: Minneapolis, St. Paul, and Duluth, Minn.; local markets consume forage crops and vegetables.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: December 21, 1908; March 7, March 24, May 1, August 23, and November 8, 1911; March 1 and April 30, 1912; February 26, May 28, June 23, and July 21, 1913; January 19, March 4, and September 24, 1914; February 5, March 2, March 17, and March 20, 1915; January 29, March 16, and April 12, 1916; March 31, 1919.

Location of lands opened: Tps. 18 and 19 N., R. 57 E.; Tps. 19 and 20 N., R. 58 E.; Tps. 21, 22, 23, 24, and 25 N., R. 59 E.; and T. 24 N., R. 60 E., Montana principal meridian; Tps. 150 and 151 N., R. 104 W., fifth principal meridian.

Limit of area of farm unit: Public, 80 acres; private, 160 acres.

Duty of water: $2\frac{1}{2}$ acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land, \$42.50 and \$45; rental charge for 1919, \$1 per acre for $1\frac{1}{2}$ acre-feet; additional water at the rate of 50 cents per acre-foot.

Annual operation and maintenance charge: 75 cents per acre for 1 acre-foot; additional water at the rate of 50 cents per acre-foot.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1903.

Construction recommended by board of engineers, April 23, 1904.

Construction authorized by Secretary, May 10, 1904.

Lower Yellowstone Dam completed, February 19, 1910.

First irrigation by Reclamation Service, season of 1909.

Entire project 87 per cent completed, June 30

IRRIGATION PLAN.

The irrigation plan of the Lower Yellowstone project provides for the diversion of water from the Yellowstone River at a point 18 miles below Glendive, Mont., into a canal on the west side of the river which extends down the valley to the confluence of the Yellowstone and Missouri Rivers, conveying water for the irrigation of land lying between the canal and the Yellowstone River. The fall of the water which will be discharged from the main canal into lateral KK at a point 19 miles below the headgates will be utilized to operate turbines direct-connected to centrifugal pumps for raising water to irrigate approximately 3,000 acres of excellent bench land.

The United States claims all waste, seepage, unappropriated spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

The completed features are the Lower Yellowstone Dam and diversion works, the main canal for a distance of 66.4 miles, and the complete lateral system in connection therewith.

The features for future construction are the pumping plant, the remaining 5 miles of the main canal, and about 52 miles of laterals, which, when completed, will irrigate approximately 15,500 acres.

SUMMARY OF GENERAL DATA FOR LOWER YELLOWSTONE
PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	59, 529
Public land entered to June 30, 1919.....	15, 091
Public land open to entry on June 30, 1919.....	91
Public land withdrawn on June 30, 1919.....	1, 988
State land unsold June 30, 1919.....	1, 451
Railroad land June 30, 1919.....	97
Private land June 30, 1919.....	40, 811
Acreage service could have supplied in season of 1918.....	42, 232
Estimated acreage service can supply in season 1919.....	42, 167
Estimated acreage service can supply in season 1920.....	45, 056
Acreage irrigated season of 1918.....	21, 075
Acreage cropped under irrigation season of 1918.....	21, 000
Acreage dry-farmed season of 1918.....	5, 345

Crops:

Value of irrigated crops season of 1918.....	\$669, 191. 00
Value of irrigated crops per acre cropped.....	31. 86
Value of dry-farmed crops season of 1918.....	60, 886. 00
Value of dry-farmed crops per acre cropped.....	11. 39

Finances:

Net construction cost to June 30, 1919.....	\$2, 893, 498. 75
Per cent completed on June 30, 1919.....	87
Appropriated for fiscal year 1920.....	\$59, 000. 00
Estimated per cent complete by June 30, 1920.....	87
Proposed appropriation fiscal year 1921.....	\$83, 000
Estimated per cent complete by June 30, 1921.....	87
Announced construction charges per acre.....	\$42. 50 and \$45. 00

Appropriation fiscal year 1919.....	55, 000. 00
Special appropriation.....	52, 000. 00
Increase miscellaneous collections.....	21, 790. 53
Increased compensation.....	3, 388. 19

132, 178. 72

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$76, 083. 42
Transfers.....	5, 781. 54
Current liabilities.....	8, 547. 07
	90, 412. 03

Unencumbered balance on July 1, 1919..... 41, 766. 69

Repayments:

Value of construction water-right contracts.....	\$1, 243, 428. 90
--	-------------------

Construction charges:

Accrued to June 30, 1919.....	74, 146. 84
Collected to June 30, 1919.....	10, 044. 75

Uncollected on June 30, 1919.....	64, 102. 09
-----------------------------------	-------------

Operation and maintenance charges (public notice):

Accrued to June 30, 1919.....	138, 467. 80
Collected to June 30, 1919.....	35, 835. 83

Uncollected on June 30, 1919.....	102, 631. 97
-----------------------------------	--------------

Water-rental charges:

Accrued to June 30, 1919.....	87, 205. 19
Collected to June 30, 1919.....	83, 896. 01

Uncollected on June 30, 1919.....	3, 309. 18
-----------------------------------	------------

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	1, 500
--	--------

Miles of drains built to June 30, 1919—	
---	--

Open.....	4. 5
-----------	------

Closed.....	1. 1
-------------	------

5. 6

Estimated acreage protected by drains to June 30, 1919.....	1, 600
---	--------

Estimated acreage to be protected by authorized system.....	1, 600
---	--------

Cost of drainage works to June 30, 1919.....	\$77, 266. 14
--	---------------

SEEPAGE AND DRAINAGE.

No drains were constructed during the year. The completed portion of Drain No. 1 has drained the seeped area along both sides, and satisfactory crops are being raised. The total seeped area on the project has not changed materially since 1914.

The areas exempted from water charges because of seepage for the past five years are as follows: 1914, 1,276 acres; 1915, 1,239 acres; 1916, 1,247 acres; 1917, 1,360 acres; 1918, 1,485 acres.

OPERATION AND MAINTENANCE.

During the season of 1918 water was delivered to 370 farms with an irrigable area of 30,790 acres, and 21,075 acres were irrigated. This was 30 per cent more than was irrigated in any previous year. The dry weather of May and June, 1918, continued to the last week of July and caused a near failure of dry-land crops. Under the ditch the most energetic measures were taken to relieve the situation, although the canal system was inadequate to supply water to all farmers immediately upon request. The peak load was maintained up to July 12, when the lower bank at mile 12 suddenly sloughed off and cracked almost to the water edge. For the next 10 days the flow was held at 425 second-feet and on July 23 the supply had caught up with the demand. The theoretical capacity of the main canal with a gauge reading of 9 is computed to be 673 second-feet, showing a loss of 200 second-feet in carrying capacity at this stage or 30 per cent. This is due to silt deposits, growth of willows, and other impediments in the canal section.

The canal mileage operated was also greater than in any previous year. Only 8 per cent of the available canals are now idle and these are mostly small laterals that extend to unimproved lands. The

main canal is operated each year for its entire length of 66 miles; 120 miles of laterals were in use the past season and 5½ miles of deep land drains were in operation. Although only 54 per cent of the land for which water was available was irrigated, it was necessary to operate 92 per cent of the available canals.

Settlement and cracking took place in the canal bank from mile 19 to 19.6 during the period of maximum flow. Because of the marsh extending along the canal in this vicinity, the lower bank has remained unstable and some movement has taken place each year that the canal was operated. This stretch of canal has been the most important feature in considering a safe load and for the past two seasons required a night patrolman. Some repairs were made here in December by reinforcing the lower bank for a distance of 200 feet.

A heavy rain that began at noon on August 15 and reached the proportions of a cloudburst extended along the valley from Savage to Fairview. The heaviest downpour appears to have taken place in the uplands just above the main canal. The rainfall at Savage was 1.65 inches in 40 minutes and 6 inches of rainfall were reported at Sidney. Surface water structures along the main canal were unable to take care of the run-off and in a number of places the water flowed over the upper canal bank, filled the canal to a depth of several feet above normal, and in flowing over the lower bank caused three serious breaks which could not be repaired in time to permit further water delivery for the season. Minor damage occurred at numerous places where the canal banks were overtopped or structures were unable to take care of the flood.

Due to the scarcity of laborers and the epidemic of influenza, it was not possible to complete the repair work on these breaks in time to make deliveries in the operating season of 1919 until June 2.

Historical review, Lower Yellowstone project.

Item.	1914	1915	1916	1917	1918	1 1919
Acreage for which service was prepared to supply water.....	36,250	42,300	42,288	42,288	42,232	42,167
Acreage irrigated.....	5,743	12,656	6,020	15,744	21,075	9,020
Miles of canals operated.....	151	163	151	180	186	169
Water diverted (acre-feet).....	25,769	40,141	27,181	60,205	51,445	16,700
Water delivered to land (acre-feet).....	9,143	17,970	7,545	27,842	23,321	7,500
Per acre of land irrigated (acre-feet).....	1.59	1.42	1.25	1.77	1.11	0.83

¹ To June 30.

SETTLEMENT.

Experience with crops without irrigation makes irrigation more popular and the development of the Lower Yellowstone project much faster. The population of the project, exclusive of the towns, has increased materially and the following comparisons showing the development since 1914 are evidence that the success of the project is assured.

	Population on irrigated farms.	Number per farm.	Owners on irrigated farms.
1914.....	732	2.0	140
1918.....	1,220	2.8	196

During the year the following changes in ownership were made as compared with the changes in 1917:

	1917	1918
Transfers of land in private ownership.....	67	43
Assignments.....	25	19
Relinquishments.....	2	1
Homestead entries.....	2	.....

Settlement data, Lower Yellowstone project.

Item.	1915 ¹	1916 ¹	1917 ¹	1918 ¹	1919 ²
Total number of irrigable farms on project.....	514	514	514	514	514
Population.....	821	821	978	1,220	1,300
Number of irrigated farms.....	260	260	323	370	320
Irrigable farms operated by owners.....	168	168	185	200	220
Irrigable farms operated by tenants.....	62	62	52	75	65
Irrigable farms having neither owner nor tenant living thereon.....	159	159	162	165	155
Number of towns.....	8	8	8	8	8
Population.....	2,145	2,145	3,310	3,500	3,500
Total population in towns and on farms.....	2,966	2,966	4,288	4,620	4,800
Number of public schools.....	19	19	19	19	13
Number of churches.....	5	5	5	8	8
Number of banks.....	9	9	10	10	10
Total capital stock of banks.....	\$230,000	\$230,000	\$330,000	\$300,000	\$402,000
Amount of deposits.....	\$908,000	\$1,388,000	\$2,352,000	\$2,000,000	\$2,365,000
Number of depositors.....	3,838	5,637	6,390	7,000	7,500

¹ Project on rental basis.

² Project on rental basis; estimated to June 30.

³ Decrease in number of schools due to consolidation.

PRINCIPAL CROPS.

Alfalfa has been the principal crop for the past three years, although the increase in acreage for 1918 was the least of record. The call for foodstuffs during the war led to a decided increase in wheat production under the ditch, which was a factor in keeping down the alfalfa acreage. About 1,300 acres of alfalfa were abandoned in the spring of 1918 as a result of winter killing or plans for crop rotation, but this was more than offset by the seeding of 1,900 acres to new alfalfa. The following tabulation shows the increase since the year 1912:

Year.	Alfalfa acreage.	Increase.	Year.	Alfalfa acreage.	Increase.
		Per cent.			Per cent.
1912.....	1,284		1916.....	6,962	15
1913.....	2,380	85	1917.....	8,693	23
1914.....	4,184	76	1918.....	9,259	6
1915.....	6,055	45			

The average yield of alfalfa for 1918 was 2.1 tons per acre and the average price was \$16 in the stack up to the end of the year; \$20 in the stack was realized in some cases, but the mild winter caused some decline in prices later in the feeding season. Alfalfa was baled and delivered on the project from distant points at \$21 to \$23 per ton.

Wheat production increased from 52,000 bushels in 1917 to 106,000 in 1918. The guaranteed price of \$2 per bushel made this a very

profitable crop with an average return of \$27.26 per acre. The increase in wheat acreage was principally at the expense of flaxseed, which fell from 3,300 acres in 1917 to 1,700 in 1918. The following table shows relative areas planted to the principal crops during the past six years:

Per cent of total crop area represented by selected crops.

Year	Alfalfa.	Wheat.	Oats.	Barley.	Flax.	Total.
1913.....	12	42	14	12	7	87
1914.....	18	26	16	11	10	81
1915.....	27	38	15	6	5	91
1916.....	31	27	14	10	8	90
1917.....	36	21	9	5	13	84
1918.....	35	30	10	6	7	88

The irrigated crop exceeds the value of dry crop by \$20.46 per acre. This difference has been very marked the past two years because of dry weather, and has led to decreased dry farming under the ditch. The difference in value of dry and irrigated crops has been in proportion to rainfall during the growing season, May to July, inclusive, as shown by the following records:

Year.	Rainfall.	Value of irrigated crop per acre.	Value of nonirrigated crop per acre.	Difference in value.
	<i>Inches.</i>			
1913.....	5.67	\$13.71	\$7.18	\$6.53
1914.....	8.53	17.33	10.64	6.69
1915.....	10.46	16.18	10.30	5.88
1916.....	9.78	20.70	18.77	1.93
1917.....	3.00	29.35	10.36	18.99
1918.....	3.70	31.85	11.39	20.46

The cloudburst on August 15 cut down the yield by drowning the low areas and later irrigation was prevented by premature ending of the irrigation season. The labor situation as regards the sugar-beet crop was not entirely satisfactory as foreigners were somewhat scarce and undependable. The area planted to beets increased from 307 acres in 1917 to 500 acres in 1918 and 1,300 acres in 1919. The average yield the past season was 6.6 tons per acre and the maximum was 11 tons. The crop was controlled by the Great Western Sugar Co., and shipped to Billings, Mont.

202 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Crop report, irrigated lands Lower Yellowstone project, Montana-North Dakota, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	6,920	Ton.....	14,630	2.1	\$16.00	\$234,080	\$33.83
Alfalfa, new.....	1,710	do.....	154	.1	16.00	2,464	1.44
Alfalfa seed.....	73	Bushel.....	287	3.9	17.00	4,879	66.83
Barley.....	1,321	do.....	29,720	22.5	.80	26,748	20.25
Beans.....	100	do.....	840	8.4	7.00	5,880	58.80
Beets, sugar.....	500	Ton.....	3,810	6.6	9.30	30,783	61.57
Corn.....	136	Bushel.....	4,470	32.9	1.30	5,811	42.73
Corn fodder.....	170	do.....	620	3.6	11.00	6,920	40.12
Flaxseed.....	1,052	Bushel.....	8,920	8.5	3.30	29,436	27.96
Garden.....	130	do.....	130	1.2	14.00	11,985	92.27
Hay.....	329	Ton.....	775	1.2	14.00	10,850	17.26
Oats.....	2,247	Bushel.....	72,200	32.1	.80	57,760	25.70
Pasture.....	480	do.....	480	1.25	.75	6,855	13.99
Potatoes.....	285	Bushel.....	35,840	125.8	1.40	26,880	94.35
Rye.....	179	do.....	1,150	6.4	2.00	1,610	8.99
Wheat.....	6,288	do.....	98,280	15.8	2.00	199,560	31.74
Miscellaneous.....	65	do.....	65	2.00	2.00	6,780	104.43
Less duplicated areas.....	1,286						
Total cropped.....	21,000	Total and average.....				669,191	31.86
		Areas.			Acres.	Farms.	Per cent of project.¹
Irrigated, no crop:							
Trees.....	25	Total irrigable area farms reported..			30,790	370	78
Stubble.....	50	Total irrigated area farms reported..			21,075	370	54
		Under water-right applications.....			1	1	.....
		Under rental contracts.....			21,074	369	54
Total irrigated acreage.	21,075	Total cropped area farms reported..			24,762	370	63

¹ Based on present irrigable area.

Crop report, nonirrigated lands, Lower Yellowstone project, Montana-North Dakota, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	419	Ton.....	467	1.1	\$16.00	\$7,472	\$17.83
Alfalfa, new.....	210	do.....	210	2.2	17.00	5,780	38.27
Alfalfa seed.....	151	Bushel.....	340	8.9	7.90	2,412	7.99
Barley.....	302	do.....	2,680	5.0	7.00	1,750	35.00
Beans.....	5	do.....	25	10.0	9.30	2,139	93.00
Beets, sugar.....	23	Ton.....	230	2.1	1.30	130	2.77
Corn.....	47	Bushel.....	100	1.7	11.00	3,025	19.02
Corn fodder.....	159	Ton.....	275	2.7	3.30	5,907	8.88
Flaxseed.....	665	Bushel.....	1,790	2.7		865	50.90
Garden.....	17	do.....	17	.7	14.00	8,442	9.73
Hay.....	868	Ton.....	603	11.7	.80	3,936	9.37
Oats.....	420	Bushel.....	4,920	69.2	1.75	2,442	51.88
Pasture.....	286	do.....	3,320	3.1	2.00	938	4.36
Potatoes.....	48	do.....	670	4.6		14,268	9.14
Rye.....	215	do.....	7,104			525	10.29
Wheat.....	1,554	do.....					
Miscellaneous.....	51	do.....					
Less duplicated areas.....	95						
Total cropped acreage.	5,345					60,886	11.39

PUBLIC NOTICES AND ORDERS.

ORDER, MARCH 31, 1919.

1. **Operation and maintenance charges for 1919.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof and supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that water will be furnished during the irrigation season of 1919 to any of the lands of the Lower Yellowstone project, Montana-North Dakota, for which irrigation works have been completed, including those under water-right applications and those receiving water on a rental basis, at the rate of \$1 per acre, which will entitle the water user to 1.5 acre-feet of water per acre. Additional water may, if required for the proper irrigation of the land, be obtained at the rate of 50 cents per acre-foot. All charges for water delivered in the season of 1919 shall become due March 1, 1920, and shall be subject to the same discounts and penalties as described in section 6 of the act of August 13, 1914 (38 Stat., 686). No water shall be furnished to any land in 1919 until full payment has been made of any delinquent charges on account of such land for preceding years on applications heretofore made with any interest due thereon.

2. **Contracts with irrigation districts contemplated.**—Steps are now being taken by the water users for the organization of two irrigation districts to include all irrigable lands of the Lower Yellowstone project, one of which will include the portion of the irrigable lands situated in Montana and one those situated in North Dakota. The completion of the organization of these districts and the execution of contracts between the districts and the United States may not be accomplished before the beginning of the irrigation season of 1919, for which reason this order is issued and is to be effective until the irrigation districts are organized and contracts between the districts and the United States are executed and approved, and in any event, shall be effective only for the irrigation season of 1919.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Lower Yellowstone project, June 30, 1919.

Cash.....		\$1,367.18
Inventory of materials and supplies.....		1,497.88
Accounts receivable:		
Current amounts due.....	\$3,378.88	
Water right charges suspended.....	166,734.06	
Water right charges unaccrued.....	1,169,282.06	
		1,339,395.00
Gross construction cost.....	2,915,081.43	
Less construction revenue earnings.....	21,591.68	
		2,893,489.75
Net construction cost.....		
Gross operation and maintenance cost.....	651,048.54	
Less operation and maintenance revenue earnings.....	98,861.43	
		552,187.11
Accounts payable.....		49,768.42
Contingent obligations.....		1,367.18
Collections and contracts of specific amounts for repayments to reclamation fund.....		1,414,703.09
Miscellaneous accruals.....		2,781.10
Capital investment:		
Disbursement, transfer, and joint construction vouchers received.....	\$3,577,571.06	
Collection, transfer, refund, and joint construction vouchers issued.....	258,244.93	
Net investment.....		3,319,326.13

Feature costs of Lower Yellowstone project.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....		\$86,006.54
Canals system:		
Diversion Dam.....	\$2,307.81	334,493.07
Main Canal:		
Headworks.....		79,533.06
0 to mile 7.6.....		355,381.79
7.6 to mile 15.9.....		353,138.68
15.9 to mile 24.5.....		282,687.61
24.5 to mile 33.6.....		119,504.45
Divisions 5, 6, 7.....		219,536.50
Structures.....		539,133.44
Highway bridges and approaches.....		77,850.17
Right of way.....	39.25	17,376.28
Miscellaneous.....		38,036.38
Total for canals system.....	2,347.06	2,416,677.03
Lateral system.....		290,069.83
Drainage system and measuring devices.....	153.48	77,266.14
Farm units and surveys.....		1,016.24
Permanent improvements and land.....		89,536.38
Telephone system.....		22,818.22
Operation and maintenance charges transferred to and compounded with construction charges.....		1,700.05
Gross construction cost June 30, 1919.....		2,915,090.43
Less revenues earned during construction period:		
Rentals of buildings.....	\$422.00	
Rentals of telephones and tolls.....	4,331.04	
Contractors' freight refunds.....	21,261.33	
Loss on messhouse operations.....	14,422.69	
		21,591.68
	2,293.58	2,893,498.75

¹ Deduct.*Statement of costs, by calendar years, Lower Yellowstone project.*

	Construction.	Operation and maintenance.			Total cost.
		Under public notice.	Water rentals.	Total.	
Year ending Dec. 31—					
1904.....	\$35,237.74				\$35,237.74
1905.....	154,318.40				154,318.40
1906.....	396,619.33				396,619.33
1907.....	1,015,975.33				1,015,975.33
1908.....	919,876.95				919,876.95
1909.....	200,754.90	\$109,192.21		\$109,192.21	309,947.11
1910.....	40,775.64	51,124.14		51,124.14	91,899.78
1911.....	9,132.04	68,140.91		68,140.91	77,272.95
1912.....	3,897.73	128,399.74		128,399.74	132,297.47
1913.....	65,154.83	36,566.74		36,566.74	101,721.57
1914.....	37,015.03	5,703.72	\$20,996.16	26,699.88	63,714.91
1915.....	14,180.56		27,900.80	27,900.80	42,081.36
1916.....	10,559.94		24,896.16	24,896.16	35,446.10
1917.....	9,081.88		32,411.78	32,411.78	41,493.66
1918.....	208.56		74,998.75	74,998.75	75,207.31
January to June 30, 1919.....	2,301.57		43,707.40	43,707.40	46,008.97
Subtotal.....	2,915,090.43	399,127.46	224,901.05	624,028.51	3,539,118.94
Plant accounts.....			25,547.31	25,547.31	25,547.31
Undistributed clearing account.....			1,472.72	1,472.72	1,472.72
Total.....	2,915,090.43	399,127.46	251,921.08	651,048.54	3,566,138.97

Statement of costs, by fiscal years, Lower Yellowstone project.

	Construction.	Operation and maintenance.			Total cost.
		Under public notice.	Water rental.	Total.	
Year ending June 30—					
1906	\$294,916.59				\$294,916.59
1907	619,569.88				619,569.88
1908	978,590.28				978,590.28
1909	701,342.76	\$51,080.95		\$51,080.95	752,423.71
1910	166,404.76	84,490.87		84,490.87	250,895.63
1911	10,847.88	50,436.92		50,436.92	61,284.80
1912	1,024.98	122,486.08		122,486.08	123,511.06
1913	13,288.54	71,520.75		71,520.75	84,809.29
1914	69,984.50	19,111.89	\$11,601.01	30,712.90	109,697.40
1915	36,657.00		21,327.09	21,327.09	57,984.09
1916	591.31		29,965.81	29,965.81	30,557.12
1917	19,411.12		24,494.88	24,494.88	43,906.00
1918	167.25		49,213.37	49,213.37	49,380.62
1919	2,293.58		88,288.89	88,288.89	90,582.47
Subtotal	2,915,090.43	399,127.46	224,901.05	624,028.51	3,539,118.94
Plant account on June 30, 1919			25,547.31	25,547.31	25,547.31
Undistributed clearing accounts			1,472.72	1,472.72	1,472.72
Total	2,915,090.43	399,127.46	251,921.08	651,048.54	3,566,138.97

Estimated cost of contemplated work, Lower Yellowstone project, during fiscal year 1920.

Principal features.	Estimated cost.
Operation and maintenance under water rental	\$57,700
Reimbursable accounts	1,300
Total	59,000

Operating costs and revenues, Lower Yellowstone project, to Dec. 31, 1918.

	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Canal system—Main canal.....	\$1,522.23	\$12,164.72	\$13,686.95	\$34,290.83	\$155,001.28	\$189,292.11
Lateral system.....	2,480.61	8,397.57	10,878.18	26,741.55	126,882.84	153,624.39
Drainage system.....		148.00	148.00		164.40	164.40
Undistributed expenses:						
Maintenance of permanent improvements.....		1,131.16	1,131.16		1,488.41	1,488.41
Camp maintenance.....		1,131.99	1,131.99		57,513.82	57,513.82
Superintendence and accounts.....		4,997.32	4,997.32		9,536.79	9,536.79
General expense.....		12,942.34	12,942.34		22,120.60	22,120.60
Telephone maintenance.....					10,872.52	10,872.52
Farm operation and maintenance.....					13,987.33	13,987.33
Diversion dam at intake.....		20,202.81	20,202.81		115,519.47	115,519.47
Repairs due to cloud-burst of Aug. 15, 1918:		5,772.07	5,772.07		99,110.05	99,110.05
Earthwork replacements.....		18,878.27	18,878.27		18,878.27	18,878.27
Concrete structures.....		4,419.60	4,419.60		4,419.60	4,419.60
Wooden structures.....		375.33	375.33		375.33	375.33
Riprap replacement.....		340.30	340.30		340.30	340.30
Damage claims paid.....		297.24	297.24		297.24	297.24
Subtotal.....	4,002.84	70,995.91	74,998.75	61,032.38	520,988.78	582,021.16
Operation and maintenance charges added to construction charges.....						¹ 1,700.05
Total.....						580,321.11
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			410.75			138,468.80
Operation and maintenance charges paid in advance by water-right applicants.....						622.21
Operation and maintenance charges forfeited by water-right applicants.....						440.00
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....						2.59
Rentals of buildings during operating period.....			372.00			7,388.59
Rentals of irrigation water.....			18,793.91			86,249.25
Rentals of telephone and tolls during operating period.....						499.97
Other revenues unclassified, earned during operating period.....			688.38			1,435.31
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....						4.63
Total.....			20,265.04			235,102.09
Difference, deficit.....			54,733.71			345,219.02

¹ Deduct.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT.

ANDREW WEISS, project manager, Mitchell, Nebr.

LOCATION.

Counties: Sioux, Scotts Bluff, Banner, and Morrill, Nebr.; Natrona, Carbon, Converse, Goshen, and Platte, Wyo.

Townships: 19 to 27 N., Rs. 48 to 67 W.; 26 to 30 N., Rs. 83 to 85 W., sixth principal meridian.

Railroads: Chicago, Burlington & Quincy; Union Pacific; Chicago & North Western; Colorado & Southern.

Railroad stations and estimated population, June 30, 1919: Bridgeport, 1,200; Bayard, 1,800; Minatare, 600; Scottsbluff, 6,000; Mitchell, 1,100; Morrill, 800; Henry, 100; McGrew, 100; Melbeta, 100; Gering, 2,500; and Haig, Nebr., 100; Torrington, 1,000; Lingle, 150; Fort Laramie, 600; Guernsey, 400; and Caspar, Wyo., 12,000.

WATER SUPPLY.

Source of water supply: North Platte River.

Area of drainage basin: 12,000 square miles.

Annual run-off in acre-feet of North Platte River: At Pathfinder, Wyo. (12,000 square miles), 1906 to 1918, maximum, 2,420,000; minimum, 870,000; mean, 1,481,000. At Whalen, Wyo. (16,200 square miles), 1900 to 1918, maximum, 2,690,000; minimum, 983,000; mean, 1,643,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

INTERSTATE UNIT.

Area for which the service is prepared to supply water, season of 1919, 129,715 acres.

Area under water-right applications and rental contracts, season of 1918, 105,350 acres.

Length of irrigating season: From April 1 to September 30—183 days.

Average elevation of irrigable area: 4,100 feet above sea level.

Rainfall on irrigable area: 9 years average 14.7 inches; 1918, 19.98 inches.

Range of temperature on irrigable area:—30° to 104° F.

Character of soil of irrigable area: Sandy loam.

Principal products: Alfalfa, cereals, corn, sugar beets, and potatoes.

Principal markets: Omaha, Nebr.; Kansas City and St. Joseph, Mo.; Denver, Colo.; central Wyoming.

PORT LARAMIE UNIT.

Area for which the service is prepared to supply water, season of 1919, 12,132 acres.

Area under rental contracts, season of 1919, 4,865 acres.

LANDS OPENED TO IRRIGATION.

INTERSTATE UNIT.

Dates of public notices and orders: July 29, 1907; May 29, June 16, November 12, 1908; March 3, March 27, June 2, 1909; March 12, April 4, June 6, June 25, July 2, September 10, 1910; March 7, March 24, April 21, December 30, 1911; March 13, March 14, March 19, May 23, June 24, September 5, 1912; February 5, March 11 (2), March 29, June 16, June 23, July 13, September 4, 1913; September 24, 1914; February 27, April 23, 1915; January 13, February 10, February 24, March 16, May 16, 1916; March 16, March 22, 1917; April 3, 1918; March 11, 1919.

Location of lands opened: Ts. 21 to 26 N., Rs. 51 to 65 W., sixth principal meridian.

Limit of area of farm units: Public, 80 acres; private, 160 acres.

Duty of water: Two and one-half acre-feet per acre per annum at the farm.

Charges per acre of irrigable land: Building, \$45 and \$55; annual operation and maintenance, 65 cents per acre-foot for water used prior to June 20 and after August 31; \$1.30 per acre-foot for water used subsequent to June 20 and before September 1, with a minimum charge of \$1.70 per acre.

FORT LARAMIE UNIT.

Date of public order: March 12, 1918.

Location of lands opened: No lands opened.

Charges for rental water, 40 cents per acre-foot delivered at farm.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1902.

Construction recommended by director March 7, 1903.

Construction conditionally authorized by Secretary March 14, 1903.

First irrigation by Reclamation Service, season of 1908.

Whalen Diversion Dam completed February, 1909.

Pathfinder Dam completed June, 1909.

Pathfinder Dike completed May, 1911.

Interstate Canal, 165 miles completed June 30, 1914.

Contract for construction of Northport district executed February 24, 1919.

Pathfinder unit, 99.1 per cent completed June 30, 1919.

Interstate unit, 96.3 per cent completed June 30, 1919.

Fort Laramie unit, 32 per cent completed June 30, 1919.

Northport district, 6 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the North Platte project provides for the storage of flood waters of North Platte River in a reservoir controlled by the Pathfinder Dam, about 3 miles below the junction of the North Platte and Sweetwater Rivers and 50 miles southwest of Casper, Wyo., and in smaller reservoirs along the canal lines; and the diversion of water from North Platte River by a dam near Whalen, Wyo., into the Interstate Canal, supplying water for lands on the north side of the river and into the Fort Laramie Canal, watering lands on the south side of the river. The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The completed features are: Pathfinder Reservoir; Whalen Diversion Dam; the first three divisions of the Interstate Canal; lateral systems of district 1, 2, and 3 of the Interstate Canal system; Reservoir No. 1, known as Lake Alice; Reservoir No. 3, known as Lake Minatare. The Fort Laramie Canal system, covering approximately 100,000 acres, and the Northport Canal system, covering approximately 15,000 acres, are now under construction.

SUMMARY OF GENERAL DATA FOR NORTH PLATTE PROJECT TO END OF FISCAL YEAR 1919.

	Interstate.	Fort Laramie.	Northport.	Total.
Areas: ¹				
Public land entered to June 30, 1919.....	82,432	25,700	6,500	114,632
Public land withdrawn on June 30, 1919.....	610	34,500	500	35,610
State land unsold June 30, 1919.....	2,309	8,200	1,400	11,909
Private land June 30, 1919.....	44,364	38,600	6,600	89,564
Irrigable acreage when project is complete...	129,715	107,000	15,000	251,715
Acreage service could have supplied in season of 1918.....	129,778	12,132	.....	141,910
Estimated acreage service can supply in season of 1919.....	129,715	12,132	.....	141,847
Estimated acreage service can supply in season of 1920.....	129,715	20,000	2,500	152,215
Acreage irrigated season of 1918.....	97,908	4,865	.....	102,773
Acreage cropped under irrigation season of 1918.....	94,445	4,865	.....	99,310

¹ Including lands of North Platte Canal & Colonization Co. on interstate unit.

Summary of general data for North Platte project to end of fiscal year 1919—Contd.

	Interstate.	Fort Laramie.	Northport.	Total.
Crops:¹				
Value of irrigated crops season of 1918.....	\$3, 100, 710. 00	\$61, 815. 00	.....	\$3, 162, 525. 00
Value of irrigated crops per acre cropped....	\$36. 35	\$12. 71	.....	.....
Finances:				
Net construction cost to June 30, 1919.....	\$6, 117, 412. 34	\$4, 232, 518. 75	\$199, 164. 79	\$10, 549, 095. 88
Per cent completed on June 30, 1919.....	96. 3	32. 0	6. 0	62
Appropriated for fiscal year 1920.....	* \$336, 000. 00	\$437, 500. 00	\$106, 500. 00	\$880, 000. 00
Estimated per cent complete by June 30, 1920.....	97. 0	37. 0	18. 0	66
Proposed appropriation fiscal year 1921....	\$324, 000	\$444, 000	\$232, 000	\$1, 000, 000
Announced construction charges per acre....	\$55. 00	.....	.....	.....
Appropriation fiscal year 1919.....	.....	.....	.....	\$881, 000. 00
Increase under 10 per cent provision.....	.....	.....	.....	88, 100. 00
Increase miscellaneous collections.....	.....	.....	.....	30, 162. 68
Balance 1918 appropriation.....	.....	.....	.....	33, 120. 23
Increase of compensation.....	.....	.....	.....	39, 104. 22
Special appropriation.....	.....	.....	.....	21, 275. 67
Total.....	.....	.....	.....	1, 092, 762. 80
Expenditures chargeable to 1919 appropriation:				
Disbursements.....	.....	.....	.....	813, 219. 15
Transfers.....	.....	.....	.....	85, 831. 64
Current liabilities.....	.....	.....	.....	71, 540. 75
Contingent liabilities.....	.....	.....	.....	1, 429. 60
Total encumbrance.....	.....	.....	.....	972, 071. 14
Unencumbered balance on July 1, 1919.....	.....	.....	.....	120, 691. 66
Repayments:				
Value of construction water right contracts.....	6, 808, 190. 50	.....	.....	6, 808, 190. 50
Construction charges—	.....	.....	.....	.....
Accrued to June 30, 1919.....	950, 327. 56	.....	.....	950, 327. 56
Collected to June 30, 1919.....	882, 916. 11	.....	.....	* 832, 916. 11
Uncollected on June 30, 1919.....	117, 411. 45	.....	.....	117, 411. 45
Operation and maintenance charges (public notice)—	.....	.....	.....	.....
Accrued to June 30, 1919.....	816, 047. 84	.....	.....	816, 047. 84
Collected to June 30, 1919.....	748, 742. 33	.....	.....	* 748, 742. 33
Uncollected on June 30, 1919.....	67, 305. 51	.....	.....	67, 305. 51
Water rental charges—	.....	.....	.....	.....
Accrued to June 30, 1919.....	36, 652. 37	.....	.....	36, 652. 37
Collected to June 30, 1919.....	35, 570. 62	.....	.....	35, 570. 62
Uncollected on June 30, 1919.....	1, 081. 75	.....	.....	1, 081. 75
Drainage:				
Estimated acreage damaged by seepage to June 30, 1919.....	3, 250	.....	.....	3, 250
Miles of drains built to June 30, 1919—	.....	.....	.....	.....
Open.....	38. 7	2. 03	.....	40. 73
Closed.....	14. 2	.....	.....	14. 2
Estimated acreage protected by drains to June 30, 1919.....	6, 780	.....	.....	6, 780
Estimated acreage to be protected by authorized system.....	7, 960	17, 000	.....	24, 960
Cost of drainage works to June 30, 1919.....	\$316, 244. 12	\$10, 255. 82	.....	\$326, 499. 94

¹ Excluding lands of North Platte Canal & Colonization Co. on interstate unit.² Includes \$56,000 for work on storage unit.³ Includes \$3,121.07 credit for existing works taken up on joint construction vouchers.⁴ Includes \$9,199.41 credit for existing works taken up on joint construction vouchers.

CONSTRUCTION DURING FISCAL YEAR.

INTERSTATE UNIT.

A few small lateral extensions were built on various parts of the project.

The Spottedtail diversion channel was begun and completed.

Two headgates were installed in the Interstate Canal for the use of the Lingle Water Users' Association.

A permanent mess house was built at the Sheep Creek operation and maintenance camp, a barn at Lake Alice Camp, and two bunk houses at Camp No. 7.

The Mitchell office building was enlarged by the addition of a second story over the entire building and extension on each side.

FORT LARAMIE UNIT.

Main Canal.—The following work on the Main Canal was completed during the year:

On division 5, station 2280 to 3260, which includes the Springer Cut, all excavation under specifications No. 357 was completed by contract forces during January, 1919. One siphon, one wasteway, two culverts, and two bridges on this division were also completed by contract forces under the same specifications in February, 1919.

On division 6, station 3260 to 3570 (Horse Creek), all earthwork excavation was completed in October, 1918, by contract forces under specifications No. 367. No structures in this division have been built. With the completion of the excavation on division 6 it has been possible to carry waste water through the Main Canal to Horse Creek.

On division 7, Horse Creek to Nebraska-Wyoming State line, station 3570 to 4503, the contract teamwork excavation, involving core-bank construction and overhaul under specifications No. 377, was practically completed at the end of year. The main part of the earthwork excavation on this division will be completed by electric drag-lines operated by Government forces.

During the year the following Main Canal structures were completed by Government forces: Sand trap at mile 0.6; five checks at miles 17.9, 21.2, 30.1, 33.0, and 36.7; three pipe turnouts and one temporary wood flume for wasting water into Horse Creek. Since April 1, 1919, final location surveys on the Main Canal in Nebraska have been in progress eastward from the State line and 20 miles are now ready for construction. Designs for structures on this section are now under way.

Lateral system.—On division 1 laterals the following work was completed: Main Cherry Creek lateral excavation was completed by contract forces on April 15, 1919, under specifications No. 373. Laterals 4.7 and 5.7, 20.1 and 17.8 extension were also completed by local contract forces. All excavation on division 1 laterals is now complete. This division includes all territory west of the Springer Divide. Two concrete siphons were built on Cherry Creek lateral by Government forces, also a number of miscellaneous lateral minor structures, which are now complete, to and including lateral 39.7.

On division 2 laterals (Springer Divide to Nebraska-Wyoming State

line), 21 schedules of earthwork excavation were completed during the year by local contract forces. On May 1 excavation on the main Springer lateral was started by electric dragline No. 1, operated by Government forces. Power is furnished by the Lingle power plant. At the end of year a total of 61,500 cubic yards had been excavated. Location surveys of all main laterals in Wyoming have been completed and the Horse Creek lateral has been located extending 10 miles into Nebraska. No structures have been built on division 2 laterals, but designs for all major structures are now nearly completed.

Power system.—All work on the Lingle power plant was practically completed during the fall of 1918, but owing to lack of funds it was deemed expedient not to start actual operation of plant for construction purpose until spring of 1919. The plant is hydroelectric type, of two units, each consisting of a 450-horsepower Trump turbine, connected to a 375-kilowatt Allis-Chalmers generator. Efficiency tests of the plant proved entirely satisfactory in every respect. Water is supplied to turbines from the Fort Laramie Main Canal at mile 25.5 through a 54-inch wood-pipe penstock, 850 feet long, with a total drop of 107 feet. Actual operation of the plant was started May 1, 1919, for supplying power to draglines Nos. 1 and 2 at work on the main Springer lateral and Cherry Creek drain, respectively.

At the end of the fiscal year, 33½ miles of permanent high tension, 10 miles of temporary high tension, and 31 miles of temporary low tension transmission lines had been built. Four substations had also been erected.

A complete repair shop for dragline repair work was built at Kiowa Camp.

Three new class 9½ Bucyrus electric drag lines were received during June, 1919, and are being moved out to their respective working locations on the Horse Creek lateral and Main Canal.

One three-room and one four-room cottage were built by contract for the use of operators at the Lingle power plant.

Telephone system.—An independent permanent telephone system comprising 84 miles of two-wire circuit has been completed by Government forces, serving all camps on the unit. Temporary branch lines have also been built to serve the electric drag lines and also the wasteways along main canal to facilitate operation and maintenance work.

NORTHPORT DISTRICT.

Location surveys for the main canal were started in July, 1918, and at the end of the year were completed to Upper Dugout Creek, or station 900 on the canal line.

Advertisement No. 384 was issued by the Washington office on October 1, 1918, for the construction of the first 13.1 miles of the canal, involving 550,290 cubic yards of excavation. Bids were opened on November 2, 1918, and were rejected on account of being too high.

The designs for 9 main canal culverts, 2 combination structures (check, turnout, and bridge), and 4 headgates were approved and construction was started by Government forces in January, 1919, and completed in June.

The contract between the United States and the Northport irrigation district for the construction of the district was executed by the

Assistant Secretary of the Interior on February 24, 1919, and provides for the expenditure of \$1,050,000.

SEEPAGE AND DRAINAGE.

INTERSTATE UNIT.

Surveys and investigations incident to design, location, and construction of drainage works were continued during the year. These investigations include borings over the affected areas and areas likely to become seeped to determine the subsoil conditions, the elevation, and periodic variation of the water table, and other factors bearing on the location and construction of drainage works.

During the year 1.03 miles of open drain were built on the Sheep Creek drain, completing the open drains on this system.

Work was continued on the Winters Creek closed drain and 1.04 miles of tile were laid.

Work was continued on the Lower Nine Mile open drain and 6.03 miles of drain were completed during the year.

Work was begun on the Wild Horse open drain under a cooperative contract with the Farmers' irrigation district, the Alliance irrigation district, and the city of Bayard. A new drag line was started at work on this drain on July 10, 1918, and during the year 5.80 miles of open drain were completed.

FORT LARAMIE UNIT.

Work was started on the excavation of the Cherry Creek drain on May 8, 1919, the work being done by an electric drag line furnished with power from the Lingle power plant; 2.03 miles of open drain were completed.

OPERATION AND MAINTENANCE.

INTERSTATE UNIT.

The system as operated during the present season consists of the Pathfinder Reservoir, the Whalen diversion dam, 95 miles of main canal, Lake Alice, 5 miles of Reservoir supply canal, Lake Minatare, Winters Creek Lake, 37 miles of high-line canal, 42 miles of low-line canal, and 626 miles of laterals.

In 1918 water to the amount of 204,819 acre-feet was delivered to 1,310 farms, containing approximately 88,771 acres in crops, exclusive of the lands of the North Platte Canal & Colonization Co. to which 39,384 acre-feet of water were delivered for the irrigation of 110 farms, containing approximately 9,137 acres in crops. The average amount of water used upon the land under the Interstate unit was 2.31 acre-feet per acre and upon the land of the North Platte Canal & Colonization Co. 4.31 acre-feet per acre. The total diversion at the Whalen Dam during the irrigation season of 1918 was 482,215 acre-feet.

During the first part of the season of 1919, 105,067 acres were entitled to water under water-right application and 17,837 acres under contract with the North Platte Canal & Colonization Co. Of this amount approximately 102,457 acres were under cultivation.

Water was diverted into the Interstate Canal on May 3, 1919, and the maximum diversion to June 30 was 1,660 second-feet. On account of the unusually hot and dry weather conditions the demand almost immediately became so great that it was necessary to operate on a rotation basis, and for that reason very little water was available for storage in Lakes Alice and Minatare.

The storage in Pathfinder Reservoir was 1,107,580 acre-feet on July 1, 1918, decreasing to 558,780 acre-feet on October 5, 1918, increasing to 928,790 acre-feet on June 2, 1919, and decreasing to 777,560 acre-feet on June 30, 1919. The highest elevation reached was 6.60 feet below the spillway elevation.

Historical review, Interstate unit, North Platte project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water.....	¹ 109,341	¹ 129,684	¹ 129,891	¹ 129,891	¹ 129,778	¹ 129,715
Acreage irrigated.....	¹ 67,700	¹ 78,057	¹ 84,208	¹ 92,553	¹ 97,908	¹ 102,457
Miles of canal operated.....	632	800	800	805	805	806
Water delivered to land (acre-feet).....	² 176,915	² 96,467	² 164,210	² 177,472	² 201,819	.....
Per acre of land irrigated (acre-feet).....	² 2.92	² 1.38	² 2.17	² 2.13	² 2.31	.....

¹ Includes North Platte Canal & Colonization Co. lands.

² Exclusive of lands under North Platte Canal & Colonization Co. tract.

FORT LARAMIE UNIT.

During the 1918 season 40 miles of main canal and 30 miles of laterals were operated. The total canal diversion was 45,740 acre-feet, of which 5,037 acre-feet were delivered to the land.

Water was diverted into the Fort Laramie Canal on April 12, 1919, for the purpose of sluicing sand through the sand trap and sluice at station 32. Water was carried to the Lingle power plant for testing purposes, the tests beginning on April 16. Deliveries for irrigation purposes were begun on May 8 and were made on demand to June 30, 1919. Water is being delivered during the season of 1919 on a rental basis only. About 6,000 acres of vacant irrigable land were leased for farming purposes to Geo. E. Abbott et al. for a period of two years beginning March 1, 1919. The lateral system was operated for the 1919 season to and including lateral 41.8, and water for seasoning purposes has been carried in the Fort Laramie Canal as far as Horse Creek at mile 67.5.

Historical review, Fort Laramie unit, North Platte project.

Item.	1918	1919
Acreage for which service was prepared to supply water.....	12,132	12,132
Acreage irrigated.....	4,865	4,708
Miles of canal operated.....	70	70
Water delivered to the land (acre-feet).....	5,037	.....
Per acre of land irrigated (acre-feet).....	1.04	.....

SETTLEMENT.

Conditions on the project continued to improve during the year, due principally to prevalent high prices for all farm products and excellent market conditions. The number of land transfers has been somewhat more than normal and the selling prices have shown a gradual increase. There is no land on the Interstate unit open for entry. No land has been opened on the Fort Laramie or Northport units. There was a large decrease in the amount of stock fed on the project during the winter, although fair profits were reported by the feeders. There is some hog cholera on the project, but it is well under control. A large amount of building is being done over the entire project, but this is especially noticeable in the towns.

Settlement data, North Platte project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project.....	1,456	1,467	1,406	¹ 1,406	¹ 1,420
Population.....	4,000	4,200	4,500	¹ 4,500	¹ 4,500
Number of irrigated farms.....	1,095	1,189	1,274	¹ 1,274	¹ 1,310
Operated by owners or managers.....	682	721	810	¹ 774	¹ 880
Operated by tenants.....	413	468	464	500	450
Population.....	3,828	3,942	4,056	¹ 4,200	¹ 4,056
Number of towns.....	7	7	7	8	8
Population.....	5,000	5,500	8,000	¹ 11,000	¹ 11,618
Total population in towns and on farms....	9,000	9,700	12,500	¹ 15,500	¹ 16,110
Number of public schools.....	34	34	40	40	40
Number of churches.....	25	25	25	25	25
Number of banks.....	15	16	16	16	21
Total capital stock.....	\$317,000	\$352,000	\$352,000	\$352,000	\$462,000
Amount of deposits.....	\$1,710,000	\$1,800,000	\$2,400,000	¹ \$2,600,000	¹ \$3,100,000
Number of depositors.....	5,700	6,000	7,000	7,200	¹ 7,500

¹ Estimated.**PRINCIPAL CROPS.****INTERSTATE UNIT.**

The cropped area has continued to increase until in 1919 it was estimated to amount to 102,457 acres, including the North Platte Canal & Colonization Co.'s lands. Of this amount about 40 per cent was in alfalfa, 36 in cereals, 13 in sugar beets, 8 in potatoes, and the remaining 3 per cent in miscellaneous crops. The total value of the crops for the Interstate unit for the year 1918 was \$3,100,711.55, with an average value of \$36.35 per acre, as compared with a total value of \$3,385,060, and an average value of \$41.92 per acre in 1917. Increased value per acre was most pronounced in the case of sugar beets. The crop yields per acre were about normal with the exception of alfalfa, which was below normal. Considerable damage was done by grasshoppers to the alfalfa and grain crops. A concerted effort is being made in the 1919 season to rid the project of these pests. On account of insufficient moisture in the ground for bringing the crops up and the subsequent hot and dry weather conditions, the indications are that the crop yields for 1919 will be below the average.

FORT LARAMIE UNIT.

The first water to be delivered for irrigation under the Fort Laramie unit was in the season of 1918. On account of the unseasoned condition of the Main Canal and the large number of breaks and interruptions which occurred the water delivery was very unsatisfactory. Attempts to put large areas under irrigation in one season resulted in losses. The estimated area in crops in 1919 is 4,708 acres, of which 70 per cent is in wheat, 19 per cent in cereals, 9 per cent in alfalfa, and 2 per cent in potatoes.

Crop report Interstate unit, North Platte project, Nebraska-Wyoming, year 1918.¹

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa hay.....	37,863	Ton.....	66,713	1.8	\$13.00	\$367,269	\$22.91	
Alfalfa seed.....	136	Bushel....	110	.8	10.00	1,100	8.08	
Sweet-clover seed.....	94	do.....	390	4.2	10.00	3,900	41.49	
Barley.....	3,550	do.....	106,080	29.9	1.10	116,688	32.87	
Beans.....	1,800	do.....	13,133	7.3	4.50	59,098	32.83	
Beets, sugar, and tops.....	6,391	Ton.....	72,684	11.4	10.75	781,353	122.26	
Beets, stock.....	13	do.....	171	13.2	7.00	1,197	92.08	
Corn.....	6,627	Bushel....	119,319	18.0	1.50	178,978	27.01	
Corn fodder.....	351	Ton.....	838	2.4	4.00	3,352	9.55	
Garden.....	347	do.....	.....	.....	.....	14,905	42.95
Hay (other).....	838	Ton.....	879	1.0	10.00	8,790	10.49	
Millet seed.....	118	Bushel....	617	5.2	1.50	925	7.84	
Oats.....	7,997	do.....	168,990	21.1	.80	135,192	16.91	
Onions.....	27	do.....	1,235	45.7	2.00	2,470	91.48	
Pasture, alfalfa.....	2,497	Acre.....	.....	.....	15.00	37,455	15.00
Pasture, other.....	618	do.....	.....	.....	5.00	3,090	5.00
Potatoes.....	6,203	Bushel....	1,035,956	167.0	.60	621,574	100.21	
Rye.....	721	do.....	8,363	11.6	1.25	10,454	14.50	
Wheat.....	9,097	do.....	133,108	14.6	1.90	252,866	27.80	
Miscellaneous.....	20	do.....	.....	.....	.....	25	1.25
Total cropped acreage..	85,308	Total and average.....					3,100,710	36.28
		Areas.		Acres.	Farms.	Per cent of unit.		
Irrigated, no crop:								
Alfalfa seeding with nurse crop.....	6,716							
Alfalfa seeding without nurse crop.....	1,156							
Fall rye.....	1,946							
Fall wheat.....	361							
Less duplicated areas.....	6,716							
Total irrigated acreage..	88,771							
		Total irrigable area farms reported..		108,086	1,310	96		
		Total irrigated area farms reported..		88,771	1,310	79		
		Under water-rights applications		88,021	1,292	78		
		Under rental contracts.....		750	18	1		
		Total cropped area farms reported..		86,308	1,310	76		

¹ Exclusive of North Platte Canal & Colonisation Co. lands.

Crop report, Fort Laramie unit, North Platte project, Nebraska-Wyoming, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	108	Ton.....	72	0.7	\$13.00	\$986	\$8.67
Barley.....	12	Bushel.....	90	7.5	1.10	99	8.25
Beans.....	89	do.....	319	8.0	4.50	1,435	26.81
Corn.....	162	do.....	3,206	20.0	1.50	4,808	29.68
Corn fodder.....	12	Ton.....	8	.7	4.00	32	2.67
Garden.....	6	do.....	.....	.....	.....	465	77.50
Hay (other).....	468	Ton.....	396	.9	10.00	3,960	8.46
Millet seed.....	39	Bushel.....	635	17.0	1.50	952	24.42
Oats:							
Liberty wheat growers..	440	do.....	14,000	32.0	.....	11,200	25.45
Farmers.....	399	do.....	11,801	30.0	.80	9,440	23.66
Wheat:							
Liberty wheat growers..	2,264	do.....	6,094	3.0	.....	11,578	5.11
Farmers.....	579	do.....	7,505	9.0	1.90	14,280	16.22
Potatoes.....	37	do.....	4,434	120.0	.60	2,650	71.63
Total cropped acreage.	4,865		Total and average.....			61,815	12.71
			Areas.		Acres.	No. farms.	Per cent of project.
			Total irrigable area farms reported:				
			Liberty wheat growers.....		3,200	9	3
			Farmers.....		3,340	30	3
			Total irrigated area farms reported:				
			Liberty wheat growers.....		2,704	9	3
			Farmers.....		2,161	30	2
Total irrigated acreage..	4,865		Total cropped area farms reported..		4,865	39	5

Crop report, North Platte Canal & Colonization Co. lands, North Platte project, Wyoming, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Rye.....	8	Bushel.....	180	23.0	\$1.25	\$225	\$28.12
Wheat.....	579	do.....	8,814	14.0	1.80	15,797	27.28
Oats.....	778	do.....	15,333	20.0	.80	12,396	15.77
Barley.....	353	do.....	10,691	30.0	1.10	11,760	33.50
Corn.....	731	do.....	11,913	16.0	1.50	17,870	24.45
Potatoes.....	950	do.....	117,459	124.0	.60	70,475	74.18
Sugar beets and tops.....	350	Ton.....	3,226	9.0	10.75	34,787	99.40
Alfalfa hay.....	4,866	do.....	9,444	1.9	13.00	122,772	25.22
Miscellaneous.....	522	do.....	.....	.....	.....	27,112	51.96
Total cropped acreage.	9,137		Total and average.....			313,064	34.26
			Areas.		Acres.	No. farms.	Per cent of project.
Total irrigated acreage..	9,137		Total irrigated area farms reported..		9,137	110	.....

SALE OF SUPPLEMENTAL STORAGE RIGHTS FROM PATHFINDER RESERVOIR TO PRIVATE LANDS.

The hydraulic studies mentioned in preceding annual reports are being continued by a competent hydrographer, and in cooperation with the State of Nebraska, for the purpose of determining losses in transmission and accessions from tributaries and obtaining such other information as will aid in a determination of water rights and proper water distribution.

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, MARCH 11, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charges for the irrigation season of 1919 and thereafter until further notice against all lands of the North Platte project, Nebraska-Wyoming, under public notice, shall be as follows: A minimum charge of \$1.70 per irrigable acre will be made whether water is used thereon or not. For all water delivered prior to and including June 20 a charge will be made of 65 cents per acre-foot; for all water delivered between June 21 and August 31, inclusive, a charge will be made of \$1.30 per acre-foot, and for water delivered on and from September 1 to the end of the season a charge will be made of 65 cents per acre-foot. The minimum charge of \$1.70 will be applied in payment of the charges under the said acre-foot rates. All operation and maintenance charges will be due and payable on March 1 of each year for the preceding irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15, or where water-right application is made after August 1 for land in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheets, North Platte project, June 30, 1919.

Cash.....		\$10,355.06
Inventory materials and supplies on hand.....		308,858.45
Current accounts due.....		194,745.68
Construction water right charges unaccrued.....		5,852,862.94
Construction work contracted.....		6,636.40
Gross construction cost.....	\$10,643,517.27	
Less operation and maintenance revenue earnings.....	\$94,030.46	
Less cost adjustments.....	390.93	
		94,421.39
Net construction cost.....		10,549,095.88
Gross operation and maintenance cost.....	1,006,489.26	
Less operation and maintenance revenue earnings.....	13,295.89	
Plus cost adjustments.....	3,873.41	
		9,422.48
		997,066.78

218 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Accounts payable.....	\$132,331.01
Contingent obligations.....	16,960.23
Collections and contracts of specific amounts for repayments to reclamation fund.....	7,671,166.17
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	\$11,937,044.87
Collection, transfer, refund, and joint construction vouchers issued.....	1,837,880.09
Net investment.....	10,099,164.78

Feature costs of North Platte project.

INTERSTATE UNIT.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Northport district.....	¹ \$4,183.30	
Secondary projects and investigations.....	9,633.74	\$61,165.14
Water-right adjudications.....		9,473.39
Subtotal.....	5,450.44	70,638.53
Storage system:		
Pathfinder Reservoir.....		1,824,042.64
Lake Alice Reservoir.....		209,730.19
Lake Minatare Reservoir.....	3,290.00	560,876.41
Two Winters Creek Lake Reservoir.....	355.40	7,436.60
Subtotal.....	3,645.40	2,602,085.93
Canal system:		
Whalen diversion dam.....	31,164.87	266,175.41
First division Interstate Canal.....	2,045.00	1,043,541.95
Second division Interstate Canal.....	4,929.88	854,270.17
Third division Interstate Canal.....	190.00	447,194.84
Subtotal.....	38,329.75	2,611,182.37
Lateral system:		
Rawhide.....		3,819.31
District No. 1.....	374.42	360,266.63
District No. 2.....	1,726.43	287,026.97
District No. 3.....	782.14	296,789.53
Subtotal.....	2,882.99	947,902.44
Drainage system:		
Drainage investigations.....	6,509.71	25,298.73
Open drains.....	69,623.77	170,603.67
Closed drains.....	7,360.43	120,341.72
Subtotal.....	83,493.91	316,244.12
Irrigable area farm units.....		43,003.29
Permanent improvements and lands:		
Buildings at Pathfinder Dam.....		5,000.00
Buildings, first division.....		5,830.65
Buildings, second division.....	² \$11,018.96	34,652.44
Buildings, third division.....	1,605.33	3,450.96
Experimental farm buildings.....		5,272.18
Subtotal.....	² 9,413.63	54,206.22
Operation and maintenance during construction (water-rental basis).....		428,457.18
Accrued and unpaid operation and maintenance transferred to construction.....		82,072.95
Total cost of construction features.....	124,388.86	7,155,793.08
Balance in plant accounts.....		120,736.13
Subtotal—Gross construction cost of the Interstate unit June 30, 1919.....	124,388.86	7,276,529.16

¹ Transferred to Northport unit.

² Deduct.

³ Right of way and damage claims transferred to their respective features.

Feature costs of North Platte project—Continued.

NORTHPORT UNIT.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys: Northport district.....	¹ \$4,183.30	\$4,183.30
Canal system:		
Surveys.....	10,876.31	10,876.31
Earthwork.....	13,576.22	13,576.22
Structures.....	13,456.26	13,456.26
Subtotal.....	37,908.79	37,908.79
Lateral system:		
Surveys.....	2,205.40	2,205.40
Earthwork.....	3,509.49	3,509.49
Structures.....	5,447.10	5,447.10
Subtotal.....	11,161.99	11,161.99
Total cost of construction features.....	53,254.08	53,254.08
Balance in plant account.....		22,075.30
Subtotal—Gross construction cost Northport unit June 30, 1919.....	53,254.08	75,329.38

FORT LARAMIE UNIT.

Examinations and surveys:		
General surveys.....		\$23,985.47
Water rights.....	\$6,350.00	6,350.00
Guernsey storage reservoir.....		2,554.24
Subtotal.....	6,350.00	32,889.71
Canal system:		
Surveys.....	3,102.35	43,878.57
Whalen Dam and headworks.....	1,721.84	26,584.00
Tunnel No. 1.....	3,228.49	168,270.90
Tunnel No. 2.....	² 610.13	147,345.52
Earthwork to State line.....	362,444.07	1,464,382.66
Concrete lining.....		14,628.69
Protecting canal banks.....	90.56	24,251.07
Roads and bridges.....	11,459.24	47,405.26
Canal right of way including fencing.....	5,760.50	8,808.45
Priming main canal.....	25,605.09	35,613.93
Sand traps.....	7,185.85	13,227.65
Siphons.....	36,528.30	108,603.14
Culverts.....	33,302.73	118,408.20
Wasteways.....	32,902.42	91,339.08
Turnouts.....	8,440.82	29,823.21
Checks.....	24,587.16	24,587.16
Minor structures.....	115.60	1,070.48
Subtotal.....	555,864.89	2,368,280.97
Lateral system:		
Surveys.....	28,344.69	108,086.55
Earthwork.....	75,433.22	142,062.06
Structures.....	33,249.70	90,914.64
Subtotal.....	137,027.61	341,063.25
Drainage system:		
Drainage investigations.....	⁴ 521.91	2,472.40
Open drains.....	7,783.42	7,783.42
Subtotal.....	7,261.51	10,255.82
Irrigable area farm units.....	2,083.72	10,024.85
Permanent improvements and lands: Buildings.....	12,301.01	22,090.10
Telephone system.....	9,676.84	24,783.02
Operation and maintenance during construction (water-rental basis).....	29,594.06	29,594.06
Total cost of construction features.....	760,159.64	2,838,971.78
Balance in plant accounts.....		452,686.95
Gross cost of construction.....	760,159.64	3,291,658.73

¹ Transferred from Interstate unit.² Correcting errors.³ Deduct.⁴ Cash collection Gering drainage district of \$879.91.

Feature costs of North Platte project—Continued.

SUMMARY, ENTIRE PROJECT.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Total cost of construction features:		
Interstate unit.....	\$124,388.86	\$7,155,793.03
Northport unit.....	53,254.08	53,254.08
Fort Laramie unit.....	760,159.64	2,838,971.78
Gross cost of construction features.....	937,802.58	10,048,018.89
Plant accounts:		
Interstate unit.....		120,736.13
Northport unit.....		22,075.30
Fort Laramie unit.....		452,686.95
Total, plant accounts.....		595,498.38
Gross construction cost.....	937,802.58	10,643,517.27
Less revenues earned during construction period:		
Rentals of buildings.....	1,637.84	8,285.89
Rentals of grazing and farming lands.....	1,569.00	24,431.17
Rentals of irrigation water.....	5,620.18	23,356.48
Contractors freight refunds.....	1,709.97	36,017.54
Value of water furnished power plant.....	939.00	939.00
Other revenues unclassified.....	539.89	1,939.88
Loss on hospital operations.....	1,7147.50	1,548.07
Total revenues to June 30, 1919.....	2,730.38	94,421.39
Net construction cost to June 30, 1919.....	935,072.20	10,549,095.88

¹ Deduct.*Statement of cost, by calendar years, North Platte project.*

	Operation and maintenance.				Total cost.
	Construction.	During construction.	Under public notice.	Total.	
Year ending Dec. 31—					
1904.....	\$95,000.00				\$95,000.00
1905.....	692,795.80				692,795.80
1906.....	1,219,052.96				1,219,052.96
1907.....	961,096.48	\$2,408.39		\$2,408.39	963,504.87
1908.....	614,953.87	8,496.18		8,496.18	623,440.05
1909.....	475,899.91	63,353.75		63,353.75	539,253.66
1910.....	448,638.71	173,660.95	\$50,697.30	224,358.25	672,996.96
1911.....	416,951.93	135,303.36	63,062.13	198,365.49	615,317.42
1912.....	355,625.45	11,587.00	65,791.53	77,378.53	433,003.98
1913.....	397,426.87	12,250.75	74,442.49	86,693.24	484,120.11
1914.....	434,328.31	16,250.00	84,026.75	100,276.75	534,605.06
1915.....	324,067.45	5,156.80	114,850.00	120,006.80	444,074.25
1916.....	644,736.59		119,693.74	119,693.74	764,430.33
1917.....	984,813.96		149,994.80	149,994.80	1,134,808.76
1918.....	1,190,548.25	16,930.15	235,176.56	252,106.71	1,442,654.96
January to June 30, 1919.....	251,958.16	12,663.91	130,826.91	143,490.82	396,448.98
Unpaid operation and maintenance charges added to construction on June 30, 1919.....		¹ 82,072.95	² 82,072.95		
Subtotal.....	9,507,894.70	540,124.19	1,006,490.26	1,546,613.45	11,054,508.15
Plant accounts to June 30, 1919.....	595,498.38				595,498.38
Total.....	10,103,393.08	540,124.19	1,006,490.26	1,546,613.45	11,650,006.58

¹ This item carried under "Construction," in prior years. Transferred to present location in order to show actual total cost of operation and maintenance.² Deduct.

Statement of cost, by fiscal years, North Platte project.

	Operation and maintenance				Total cost.
	Construction.	During construction.	Under public notice.	Total.	
Year ending June 30—					
1905.....	\$190,000.00				\$190,000.00
1906.....	1,195,591.61	\$2,408.39		\$2,408.39	1,198,000.00
1907.....	1,242,513.82	8,486.18		8,486.18	1,251,000.00
1908.....	679,680.98	63,353.75		63,353.75	743,034.73
1909.....	550,226.76	173,660.95		173,660.95	723,887.71
1910.....	401,573.07	135,303.36		135,303.36	536,876.43
1911.....	495,704.37	11,587.00	\$101,394.61	112,981.61	608,685.98
1912.....	338,198.89	12,250.75	64,729.66	76,980.41	415,179.30
1913.....	373,052.00	16,250.00	66,853.40	83,103.40	456,155.40
1914.....	421,780.94	5,156.80	82,031.58	87,188.38	508,969.32
1915.....	446,895.66		86,021.92	86,021.92	532,917.61
1916.....	348,531.53		108,423.94	108,423.94	456,955.47
1917.....	855,548.91		115,514.49	115,514.49	971,063.40
1918.....	1,060,387.61		228,289.61	228,289.61	1,288,677.22
1919.....	908,208.52	29,594.06	235,303.00	264,897.06	1,173,105.58
Unpaid operation and maintenance charges added to construction to June 30, 1919.....		\$ 82,072.95	\$ 82,072.95		
Subtotal.....	9,507,894.70	540,124.19	1,006,489.26	1,546,613.45	11,054,508.15
Plant accounts.....	595,498.38				595,498.38
Total.....	10,103,393.08	540,124.19	1,006,489.26	1,546,613.45	11,650,006.53

¹ This item carried under "Construction" in prior years. Transferred to present location in order to show actual total cost of operation and maintenance.

² Deduct.

Estimated cost of contemplated work, North Platte project, during fiscal year 1920.

Features.	Sub-feature.	Principal feature.
Storage system: Pathfinder Dam regulating works.....		\$150,000
Canal system:		
Interstate unit.....	\$3,500	
Cherry Creek drain and wasteway.....	60,000	
Indian Creek drain and wasteway.....	8,600	
Northport Canal.....	82,000	154,100
Lateral system:		
Interstate unit.....	4,300	
Fort Laramie unit.....	170,000	174,300
Drainage system: Interstate unit.....		60,000
Operation and maintenance, water rentals.....		20,000
Operation and maintenance, public notice.....		190,000
Reimbursable accounts.....		6,000
Total.....		754,400

222 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating costs and revenues, North Platte (Interstate) project, to Dec. 31, 1918.

	Calendar year 1918.			To end calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage works:						
Pathfinder Reservoir.....	\$8,925.00	\$940.80	\$9,865.80	\$33,524.74	\$6,321.79	\$39,846.53
Lake Alice Reservoir.....	271.24	295.54	566.78	4,012.74	1,203.31	5,216.05
Lake Minatare Reservoir.....	5,556.97	2,016.99	7,573.96	7,022.19	7,219.99	14,242.08
Gaging North Platte River.....	3,249.68		3,249.68	14,661.72		14,661.72
	18,002.89	3,253.33	21,256.22	59,221.39	14,744.99	73,966.38
Canal system:						
Whalen diversion dam.....	3,246.72	606.79	3,853.51	11,856.97	1,179.30	13,036.27
First division Main Canal.....	12,893.48	32,650.29	45,543.77	77,403.73	171,309.13	248,712.86
Second division Main Canal.....	6,010.88	20,275.96	26,286.84	43,352.02	60,669.14	104,021.16
	22,151.08	53,535.04	75,686.12	132,612.72	233,157.57	365,770.29
Lateral system:						
Rawhide 1st and 2d lateral districts.....	17,177.57	64,255.77	81,433.34	139,163.66	187,884.23	327,047.89
Third lateral district.....	12,755.27	37,255.11	50,010.38	58,578.88	104,163.57	162,742.45
	29,932.84	101,510.88	131,443.72	197,742.54	292,047.80	489,790.34
Drainage system:						
Open drains.....		4,393.75	4,393.75	721.20	21,866.47	22,587.67
Closed drains.....		977.29	977.29	80.13	2,429.61	2,509.74
		5,371.04	5,371.04	801.33	24,296.08	25,097.41
Undistributed expenses: Crop reports	694.76	724.70	1,419.46	3,110.88		3,110.88
Subtotal.....	70,781.57	164,394.99	235,176.56	393,488.86	564,246.44	957,735.30
Less operation and maintenance transferred to construction.....						182,072.95
Total.....						875,662.35
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			211,954.51			822,350.62
Operation and maintenance charges paid in advance by water-right applicants.....			1,385.65			1,947.76
Operation and maintenance charges paid and forfeited by water-right applicants.....			32.00			1,223.95
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			2,238.49			4,468.84
Rentals of irrigation water.....			2,626.85			15,363.19
Gain on farming operations.....			740.71			1,782.59
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			13,690.51			18,911.25
Total.....			215,287.70			838,225.70
Difference (deficit).....			19,888.86			37,436.65

¹ Deduct.

NEVADA, NEWLANDS (FORMERLY TRUCKEE-CARSON) PROJECT.

JOHN F. RICHARDSON, project manager, Fallon, Nev.

LOCATION.

Counties: Churchill, Storey, and Lyon.

Townships: 17 and 18 N., Rs. 17 to 30 E.; 19 N., Rs. 26 to 31 E.; 20 N., Rs. 22 to 31 E., Mount Diablo meridian.

Railroad: Southern Pacific.

Railroad stations and estimated population, June 30, 1919: Fernley, 100; Hazen, 100; Fallon, 2,000; Stillwater, 25.

WATER SUPPLY.

Source of water supply: Truckee and Carson Rivers.

Area of drainage basin: 3,450 square miles.

Annual run-off in acre-feet: Truckee River at Tahoe (519 square miles), 1901 to 1918, maximum, 704,000; minimum, 113,000; mean, 274,500. Truckee River at Derby dam (1,740 square miles), 1900 to 1918, maximum, 1,435,000; minimum, 356,000; mean, 842,400. Carson River at Empire (988 square miles), 1901 to 1918, maximum, 731,000; minimum, 172,000; mean, 392,800.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to supply water, season 1919: 65,752 acres.

Area under water-right applications and rental contracts, season 1919: 55,357 acres.

Length of irrigation season: From April 1 to October 15, 198 days.

Average elevation of irrigable area: 4,000 feet above sea level.

Rainfall on irrigable area: Average 4 inches (maximum record 1913, 8.08 inches).

Range of temperature on irrigable area: -20° to 100° F.

Character of soil of irrigable area: Exceedingly variable; sand, sandy loam, adobe, clay, and volcanic ash.

Principal products: Alfalfa, small grain, potatoes, onions, sugar beets, truck crops, and dairy products.

Principal markets: Nevada and Pacific coast communities.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: May 6, November 1, 1907; January 30, April 4, June 5, December 26, 1908; March 1, September 28, 1909; April 26, September 16, 1910; April 22, October 17, 1911; February 8, June 13, 1912; January 17, June 23, July 15, July 21, 1913; August 19, December 16, 1914; January 30, February 26, March 20, May 13, November 12, 1915; January 17, February 11, 1916; March 10, March 22, July 16, July 31, October 30, 1917; January 2, January 15, April 3, April 10, May 7, May 20, July 9, August 14, October 1, December 3, 1918; April 23, May 31, 1919.

Location of lands opened: Ts. 17 to 20 N., Rs. 23 to 31 E., Mount Diablo meridian.

Limit of area of farm units: 40 to 160 acres.

Duty of water: 3 acre-feet per acre per annum at the farm.

Building charge per acre of irrigable lands: \$22, \$30, \$60, \$65, and \$115 (for Carson Lake leveled lands).

Annual operation and maintenance charge per acre of irrigable land: Fernley and Hazen benches, approximately \$3.12 per acre; Fallon district, approximately \$1.95 per acre, based on cost of service.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1902.

Construction recommended by director, March 7, 1903.

Construction conditionally authorized by Secretary, March 14, 1903.

Truckee Canal completed June, 1905.

Carson River headworks and main distributing canals completed September, 1905.

First irrigation by Reclamation Service season of 1906.

Truckee Canal chute completed November, 1910.

Lahontan Dam commenced January, 1911.

Lahontan Dam completed June, 1915.

United States took possession of outlet works at Lake Tahoe and assumed control July 1, 1915.

Truckee-Carson irrigation district organized November 16, 1918.

Entire project 52 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Newlands project provides for the storage of water on the headwaters of Truckee River, in Lake Tahoe, in the Alkali Flat Reservoir, near Churchill, Nev., and in Lahontan Reservoir on Carson River; the diversion of water from Truckee River by a dam about 20 miles below Reno, Nev., into the Truckee Canal, supplying water to lands in the Truckee and Carson River valleys and to the Lahontan Reservoir; the diversion of water from Carson River by a dam near Dayton, Nev., for storage in Alkali Flat Reservoir and irrigating lands in Churchill Valley below that reservoir; and the diversion of water from Carson River by a dam about 5 miles below the Lahontan storage dam into two canal systems, one on either side of the river, watering lands in the lower Carson River Valley. The United States claims all waste, seepage, unappropriated spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The features of the above irrigation plan which have been completed are: The dam at the outlet of Lake Tahoe, including the greater portion of the accessory dredging of the Truckee River Channel; the diversion dam in Truckee River near Derby, Nev., the Truckee Canal carrying water from this diversion 31 miles to the terminal concrete chute discharging into the Lahontan Reservoir; the forebay for the hydroelectric plant discharging Truckee Canal water into Carson River below Lahontan Dam; the diversion dam in Carson River situated about 5 miles below Lahontan Dam; that portion of the irrigation system which includes laterals taking out of Truckee Canal in the vicinity of Fernley and Hazen; and the two main canals heading at Carson diversion dam and extending over the main portions of the project in Carson sink, with Fallon as a center.

Construction of Lahontan Dam and Reservoir was completed in June, 1915, for the conservation of the flood waters in both the Truckee and Carson Rivers.

The features remaining for future construction are: The Alkali Flat Reservoir, or equivalent reservoirs in the upper Carson Valley, as may later be determined; the upper Truckee storage reservoirs as required; the extension of the irrigation system to cover additional irrigable areas adjacent to and on all sides of the project as already constructed; and the extension of the drainage system which may become necessary as supplemental construction in behalf of the water users under the provisions of the reclamation extension act, or which may be constructed under contract with the Truckee-Carson irrigation district.

SUMMARY OF GENERAL DATA FOR NEWLANDS PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	1 231, 000
Public land entered to June 30, 1919.....	27, 839
Public land open to entry on June 30, 1919.....	470
Public land withdrawn on June 30, 1919.....	89, 351
Railroad land June 30, 1919.....	26, 900
Private land June 30, 1919.....	86, 440
Acreage service could have supplied in season of 1918.....	71, 817
Estimated acreage service can supply in season 1919.....	65, 752
Estimated acreage service can supply in season 1920.....	67, 000
Acreage irrigated season of 1918.....	42, 311
Acreage cropped under irrigation season of 1918.....	41, 490

Crops:

Value of irrigated crops season of 1918.....	\$1, 626, 142
Value of irrigated crops per acre cropped.....	\$53. 15

* Includes Upper Carson unit of 39,000 acres.

Finances:

Net construction cost to June 30, 1919.....	\$6, 370, 141. 73
Per cent completed on June 30, 1919.....	52
Appropriated for fiscal year 1920.....	\$359, 000. 00
Estimated per cent complete by June 30, 1920.....	55
Proposed appropriation for fiscal year 1921.....	\$664, 000. 00
Estimated per cent complete by June 30, 1921.....	60
Announced construction charges per acre, \$22, \$30, \$60, \$65, ¹ \$115.00	

Appropriation fiscal year 1919.....	\$671, 000. 00
Deduction under 10 per cent provision.....	² 67, 100. 00
Increase miscellaneous collections.....	43, 682. 68
Balance 1918 appropriation.....	539, 943. 00
Increased compensation.....	13, 560. 19
	<u>\$1, 201, 085. 87</u>

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$250, 299. 08
Transfers.....	20, 061. 01
Current liabilities.....	37, 500. 00
Contingent liabilities.....	307, 860. 09

Unencumbered balance on July 1, 1919.....	<u>893, 225. 78</u>
---	---------------------

Repayments:

Value of construction water-right contracts.....	<u>1, 431, 587. 25</u>
--	------------------------

Construction charges:

Accrued to June 30, 1919.....	378, 501. 95
Collected to June 30, 1919.....	³ 374, 848. 06
Uncollected on June 30, 1919.....	<u>3, 653. 89</u>

Operation and maintenance charges (public notice):

Accrued to June 30, 1919.....	372, 697. 60
Collected to June 30, 1919.....	⁴ 355, 651. 62
Uncollected on June 30, 1919.....	<u>17, 045. 98</u>

Water rental charges:

Accrued to June 30, 1919.....	9, 053. 40
Collected to June 30, 1919.....	8, 989. 90
Uncollected on June 30, 1919.....	<u>63. 50</u>

Power charges:

Accrued to June 30, 1919.....	76, 617. 48
Collected to June 30, 1919.....	74, 465. 91
Uncollected on June 30, 1919.....	<u>2, 151. 57</u>

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	12, 000
Miles of drains built to June 30, 1919—	
Open.....	14. 32
Closed.....	3. 99
Total.....	<u>18. 31</u>
Estimated acreage protected by drains to June 30, 1919.....	15, 300
Estimated acreage to be protected by authorized system.....	19, 500
Cost of drainage works to June 30, 1919.....	<u>\$109, 518. 45</u>

¹ For leveled lands.² Deduct.³ Includes \$5,436.50 taken up on joint construction vouchers.⁴ Includes \$6,158.26 taken up on joint construction vouchers.

CONSTRUCTION DURING FISCAL YEAR.

Lateral construction.—Work under this feature consisted of the following:

South Fork Lateral, 6,900 feet in length, involving 5,400 cubic yards of excavation, was constructed during July and August, 1918. This work was done by Government forces for the purpose of diverting seepage and waste waters from the South Fork of the Carson River at a point above the Peter Mori Dam, conveying the same to the "AA" Canal.

E4' Lateral Extension, 7.1 miles in length, involving 30,000 cubic yards of material, was constructed by Government forces for the irrigation of the Carson Lake pasture. Seventeen minor timber structures were installed. Work was commenced during July, 1918, and completed during December, 1918. Capacity of this lateral is about 27 second-feet.

During November and December, 1918, the LF lateral, 2.1 miles in length, was reconstructed and extended, about 15,325 cubic yards of material being removed by Government forces. This lateral will irrigate the proposed Grimes pasture area and also the Carson Lake pasture.

Work on N lateral improvement consisted in the change in lateral grades and cross section. Numerous concrete and timber structures were raised and about 7,700 cubic yards of material were removed by Government forces.

During March, 1919, the K9x Lateral Extension, involving the removal of 3,004 cubic yards of material, was constructed by contractors J. A. Wood and S. M. Fulkerson, and the Heritage Lateral, requiring 1,750 cubic yards of excavation, was built by contractor T. V. Conner. The Brooner lateral, with 354 cubic yards of excavation, was constructed by Government forces during March.

The Bx lateral extension, about 1,350 feet in length and requiring 1,925 cubic yards of excavation, was constructed during April under contract by J. A. Wood. A timber flume 190 feet in length, across the South Fork of the Carson River, was completed for this lateral on May 10, 1919, by Government forces.

Under the Peter Mori vested water-right contract, dated May 17, 1919, and approved June 12, 1919, the service agreed to construct a timber flume across the South Fork of the Carson River for the irrigation of certain lands owned by Mr. P. Mori. Construction of the flume, which is 86.6 feet in length, was commenced on June 14 and completed June 28.

On June 20, 1919, bids were opened for the reconstruction of the "Q" laterals and sublaterals in the Soda Lake district, involving the removal of about 17,000 cubic yards of material. Division of this work was made between 7 schedules. Only one proposal was received; J. A. Wood bid on Schedule I at 18 cents per cubic yard, and this schedule was awarded to him. Proposals were later received on the remaining schedules and they will be completed under contract.

During the fiscal year about 112 minor lateral timber structures were installed. Seven timber structures costing from \$100 to \$500 and two timber structures costing \$500 or over were also installed.

Land preparation.—Under a form of contract approved June 12, 1918, by the director and chief engineer land leveling by Government

forces was done on 11 farm units owned by J. P. Green, F. P. Steinbrook, E. S. Evans, D. W. Lucas, R. L. Combs, W. F. Davenport, O. F. Heizer, Zay Barber, Percy Mills, Martin Strasdin, and Fred Pfum. Areas aggregating about 335 acres were leveled on these places. Work of this nature was discontinued during March, 1919, after which time the Government tractors and leveling equipment were rented to project water users to carry on private land leveling operations.

Drainage construction.—The only drainage construction work in progress during the year chargeable to construction consisted in the completion of the Fernley drains the work on which was commenced November 22, 1917. These drains were completed July 10, 1918, a total of 132,858 cubic yards of material being moved in a length of 18,213 feet. Work was done by Government forces under supplemental construction, under public notice dated October 30, 1917. Structures installed in this drain consisted of one redwood timber drop; one 24-inch cast iron culvert under the Southern Pacific railroad, one 36-inch corrugated culvert under K2B' lateral, four metal flumes, and five timber highway bridges.

Cleaning of the lower end of the South Fork of the Carson River to the "Lc" drain and including a portion of this drain was commenced June 11, 1918, and continued to station 152 + 90, at which point work was discontinued as an expenditure of approximately \$2,700 had been incurred. Verbal agreement had been entered into between the project manager and water users in the district to be benefited, that about \$3,000 would be expended. The cost of this work was charged to maintenance. A Monighan dragline excavator with 1 cubic yard Page bucket was used.

Truckee Canal improvement.—This work was commenced on October 7, 1918, at Truckee Canal station 549 + 00 using the old Monighan dragline excavator which had been repaired and overhauled following Fernley drain construction.

This work consisted in the reinforcement of the lower canal bank by enlarging the cross section. At the end of the fiscal year the bank had been strengthened between stations 549 and 716. About 3,000 linear feet of bank were also reinforced during May and June, 1919, at the lower end of the canal north of Lahontan, using the new Monighan dragline excavator which was shipped to Lahontan on April 22, 1919.

Without work of this nature being done, the canal was unsafe for carrying even moderate amounts of water and it would be impossible to operate it at its originally contemplated capacity of 1,200 second-feet. Pending the approval of final plans for the improvement of the whole canal it is planned to continue this work, strengthening the banks at the weakest places.

Lahontan Dam spillway and outlet gate repairs.—Work of resurfacing the right Lahontan Dam spillway and a portion of the spillway pool rim, which was commenced during the fiscal year 1918, was completed during August, 1918. An area of about 31,600 square feet of the concrete surface was resurfaced with from 1 to 3 inches of gunite.

Repair of the high pressure outlet gates was completed during November, 1918, with the installation of two new cylindrical gate

valves and construction of concrete radial walls in the gate chamber to reduce the rotary water motion.

"T" Line Canal improvement.—The work of strengthening the lower bank of the "T" Line Canal at the Trolson Bend was commenced on May 22 at station 36+00 and at the end of June, 1919, station 67+00 had been reached. Monighan dragline excavator No. 4 which was received on the project on May 10, 1919, was used for this work. As originally designed this canal was to carry about 400 second-feet, but owing to the lower bank being of insufficient cross section it has been impossible to safely convey more than about 150 second-feet of water in the same. During 1917 canal breaks at the Trolson Bend necessitated the payment of damages by the service for the injury of adjacent farming lands. Development of lands in the Soda Lake district now being opened will require more water than the canal has been able to carry without improvement.

Project shops and yards.—The erection of new project shops, warehouses, and yards on a site purchased from the Williams Estate Co. near the Fallon Railroad depot, and more accessible to the project office, was commenced during April; these were sufficiently completed during June to be placed in operation. Construction of a railroad spur and the finishing of minor buildings remained to be done at the end of the fiscal year.

Miscellaneous.—Construction of about 1 mile of road to replace a portion of the Fallon-Carson City road (Lincoln Highway) which was submerged by the Lahontan Reservoir was necessary during May, 1919. One timber culvert 24 feet in length was installed.

A new timber canal turnout to supplement the delivery of water to the "K1b" lateral and to permit the abandonment of a portion of this ditch was installed during February, 1919, at Truckee Canal station 645. The cost of this work was charged to maintenance.

A new ditchrider's house and station was built during July, 1918, on land purchased by the service from John Wilson and L. A. Beckstead in sec. 23, T. 18 N., R. 28 E., M. D. M.

On September 19, 1917, contract was entered into between the United States and E. S. Berney for the lease of the N. $\frac{1}{2}$ NE. $\frac{1}{4}$ of sec. 35, T. 18 N., R. 29 E., M. D. M., for agricultural purposes. This contract was approved January 25, 1918, by Morris Bien, acting director. This unit had been rough leveled by the Government, and under the contract E. S. Berney finished leveling the unit, made levees, constructed farm ditches and drains, and installed irrigation structures. Wheat and barley were planted by the lessee, which, when harvested during August, 1918, yielded about 39.6 tons of wheat and 8.5 tons of barley, of which amount, in consideration of the lease, the service received a one-fifth share. This lease expires September 1, 1919. Alfalfa seed, purchased by the service, was planted with wheat on this tract during the spring of 1919. The service is to receive a one-third portion of the 1919 crop.

Upper Carson unit investigations, which were commenced August 2, 1917, were terminated at the end of the fiscal year, and the office at Minden, Nev., was closed on June 30, 1919.

The survey of Lake Tahoe shore-line ownerships and investigations were commenced on June 2, 1918, and actively continued in the field until about September 30, after which time mapping and other office work was carried on until about December 15, 1918. On

April 23, 1919, active preparations were started for the dragging or sounding of Lake Tahoe under the supervision of an officer of the United States Coast and Geodetic Survey. This survey was completed in June, 1919, after which the surveys of the Truckee River and the railway, owned by the Lake Tahoe Railway & Transportation Co., below Lake Tahoe, were commenced. Surveys at Lake Tahoe have been made for the purpose of obtaining data for use in the settlement of the rights of the United States to regulate the lake as a storage reservoir.

During the year the collection and preparation of evidence for the adjudication of the Truckee River water rights before the Federal court at Carson City were continued. This suit has been called for hearing August 4, 1919. The collection of evidence was commenced during 1913.

SEEPAGE AND DRAINAGE.

Based upon surveys and examinations made during August, 1918, recommendation was made and approved granting temporary suspension of charges on 1,221 acres of seeped and alkali lands. This represented an area of about 97 acres in excess of that upon which charges were suspended during the previous year. This represents only a portion of the lands so affected, but many of the owners are backward about taking advantage of having their charges suspended owing to the effect this might have upon the sale value of their places.

As previously mentioned, the only drainage construction work done during the year consisted in the completion of the Fernley drain and the deepening of a portion of the "Lc" drain.

On November 9, 1918, more detailed drainage investigations, covering the entire project, were commenced and continued until the end of May, 1919. Under date of April 22, 1919, a drainage report by a board of engineers consisting of Drainage Engineer J. L. Burkholder, Dr. Elwood Mead, and Project Manager John F. Richardson, was prepared and submitted to the chief of construction on the subject of "Drainage—Newlands project." On May 12, 1919, the board of directors of the Truckee-Carson irrigation district passed a resolution approving the plans for drainage as outlined in the report above mentioned.

BOARD MEETINGS.

Date.	Topic.	Personnel.
1918.		
Nov. 27	Appraisal of damages to riparian landowners around Lake Tahoe.	Engineer James Munn and Project Manager J. F. Richardson.
1919.		
Jan. 30	Upper Carson project.....	D. C. Henny, consulting engineer, and John F. Richardson, project manager.
Jan. 31	Truckee Canal capacity.....	Do.
Feb. 5	Pyramid unit versus Upper Carson unit for early construction.	Do.
Apr. 4	Land leveling—Newlands project.....	Engineer James Munn and Project Manager John F. Richardson.
Apr. 22	Drainage of Newlands project, Nevada.....	Drainage Engineer J. L. Burkholder, Dr. Elwood Mead, and John F. Richardson, project manager.

OPERATION AND MAINTENANCE.

Water supply.—The natural flow of the Truckee and Carson Rivers, with the combined storage in Lake Tahoe and Lahontan Reservoir, was far in excess of the project irrigation demands. Lake Tahoe reached its maximum elevation of 6,228.70 feet on June 23, 1918. Although this elevation represents a total storage of 564,000 acre-feet, it did not permit any new accumulation of United States reserved waters, as the basis for such storage is elevation 6,229 feet. The Lahontan Reservoir also reached its maximum elevation of 4,146.50 feet on June 23, 1918, with a storage of 153,580 acre-feet.

At the end of the irrigation season on October 15, 1918, there remained in Lake Tahoe 24,938 acre-feet of United States storage carried over from the 1917 accumulation. Lahontan Reservoir contained 84,150 acre-feet at the close of the season, none of which was wasted during the winter, as in previous years.

The snow accumulation at Summit, Calif., during the winter of 1918-19 began about the middle of October, reached its maximum depth of 150 inches on March 15, and disappeared about the 1st of June. While this snowfall was about 30 inches greater than during the winter of 1917-18, it was only about two-thirds of the normal. Snowfall on the other watersheds of the Truckee and Carson Rivers was also below normal, which, following the extremely light fall during the previous year, accounts for the small amount of run-off.

Lake Tahoe reached its maximum elevation of 6,228.06 feet on June 8, 1919, which represents a total storage of 487,200 acre-feet but no new reserve for the United States. Lahontan Reservoir reached its maximum elevation of 4,159.50 feet on June 5, 1919, which was the maximum elevation on record and which indicated a storage of 249,700 acre-feet. At the beginning of the 1919 irrigation season the United States reserve storage in Lake Tahoe amounted to 16,712 acre-feet. On July 1, 1919, this reserve had been cut down to about 13,000 acre-feet, which was deemed sufficient for project needs under the Truckee Canal for the current season.

Use of water.—The following table shows the use of water on the Newlands project for the years 1910 to 1918 inclusive:

Year.	Area irrigated.	Amount of water.				Duty of water.	
		Diverted.	Wasted.	Lost.	Distributed to farms.	Gross.	Net.
	<i>Acres.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Feet.</i>	<i>Feet.</i>
1910.....	27,562	177,577	12,570	36,758	128,249	6.00	4.65
1911.....	30,139	212,562	14,943	51,873	147,746	6.56	4.48
1912.....	36,620	164,063	1,496	82,656	86,611	4.48	2.50
1913.....	43,075	186,175	10,966	68,234	106,975	5.68	2.25
1914.....	39,615	268,028	49,568	80,356	138,104	6.77	3.28
1915.....	40,295	233,693	49,018	66,440	118,235	5.80	2.94
1916.....	39,449	264,186	54,429	78,964	130,793	6.69	3.32
1917.....	40,392	263,433	53,017	85,021	125,375	5.27	3.06
1918.....	42,311	266,927	38,918	101,464	126,545	6.31	2.99
Mean.....						5.90	3.29

The irrigation season of 1918 opened March 20 and closed October 15. During this period the Truckee and "V" and "T" Canals were operated continuously for the delivery of water to 648 farms con-

taining 42,311 acres of irrigated land. This was the largest area irrigated in the history of the project. During the irrigation season 355.8 miles of canal were operated and maintained, comprising 77.3 miles of main canal of over 300 second-feet capacity and 278.5 miles of main and distributing laterals. Service was uninterrupted under the main canals. The Truckee Canal was also operated continuously throughout the winter for delivery of water to the Lahontan power plant and storage in Lahontan Reservoir.

The operation was carried on by the water master, assisted by 1 hydrographer, 3 gate tenders, and 12 ditch riders.

Maintenance.—The ditch cleaning and structure repair work was done for the most part during the nonirrigation season. During the year 72 miles of canal and laterals and 2½ miles of open drain were cleaned. The lateral cleaning was done largely using teams and fresno scrapers. A drag-line excavator was used to clean the main canals and the open drain. Trees and willows were also pulled from the banks of 9 miles of main canal during the irrigation period. About 34 old structures were replaced by new ones and 86 structures of various types repaired.

Considerable trouble was experienced with moss and other aquatic plant growth in the shallower canals and laterals. A force consisting of about 16 head of stock and 8 to 10 men was occupied almost continuously after July 1 in dragging heavy anchor chains and spring-tooth harrows through the ditches and mowing with hand scythes.

Beyond the burning of tules and weeds and removing material washed into the various open drains, very little maintenance work was done.

One new ditch rider's house was built and repairs, such as papering and addition of screen porches, made on several old houses.

Water meters were installed at the Southern Pacific Railroad Co.'s water-tank take-outs from the Truckee Canal at Gilpin and Hazen in order to determine accurately the quantity of water used and if it is in excess of the company's vested right of 200,000 gallons per day.

Two new Monighan drag-line excavators were received and placed on cleaning and strengthening the banks of the Truckee and "T" Canals.

A cut-off trench about 330 feet long and 19 feet deep, to serve as a drain for the protection of the "Ky" lateral flume and chute, was excavated during January, 1919. A new timber chute was installed to replace the old metal chute on this lateral.

On April 22, 1919, a new Monighan drag-line excavator was received and unloaded at Lahontan. This machine cleaned the Lahontan power plant fore bay and the lower end of the Truckee Canal above the chute during April and May.

The Reclamation Service and community suffered a severe loss on November 20, 1918, in the death of Supt. of Irrigation James G. Gault. Mr. Gault had been employed on the project almost since its inception.

Considerable difficulty was experienced in procuring sufficient labor during the war period, owing to the farmers on the project offering better wages than paid by the Reclamation Service. At present, however, there is an abundance of labor available, but the Government is obliged to pay the farmers' scale of about \$4.50 per day.

Historical review, Newlands project.

Item.	1914	1915	1916	1917	1918	To June 30, 1919.
Acreage for which service was prepared to supply water.....	52,039	65,000	70,915	70,915	71,817	65,752
Acreage irrigated.....	39,615	40,285	39,449	40,392	42,311	45,000
Miles of canal operated.....	300	304	306	355	356	360
Water diverted (acre-feet).....	268,028	233,691	264,186	263,413	266,927	.....
Water delivered to land (acre-feet).....	138,104	118,235	130,793	125,375	126,545	.....
Per acre of land irrigated (acre-feet).....	3.28	2.94	3.32	3.05	2.99	.....

SETTLEMENT.

During the fiscal year ending June 30, 1919, 28 homesteads aggregating 1,973 acres of land were entered. Fourteen water-right applications, covering 771 acres of irrigable land in private ownership, were filed and 4 Carson River water-rights were settled, amounting to 1,052 acres of irrigable land, making a total of 3,796 acres. Against the above figures are recorded 3 cancellations covering 141 acres, leaving a net gain of 3,655 acres over the preceding year.

The status of available land on the project has been very discouraging to settlement during the year. Such public land as was open to entry has been on the farm unit plats for a number of years and is scattered in isolated tracts over practically the entire project.

By this process the best of the available land has been picked out until there is nothing subject to homestead entry that will attract settlement.

The private land subject to water-right application remaining on the farm unit plats bears an accrued penalty of \$12 per acre, making the water-right cost \$72 an acre.

Numerous prospective settlers have looked these lands over and decided to go elsewhere or wait until new lands are opened at the \$60 rate of construction charge.

Under these circumstances the showing made for the fiscal year ending June 30, 1919, is considered good, as the increase in acreage was made by prospective settlers going over the project and finding a tract of land to suit them and asking to have the tracts opened for filing, which has been done in every case.

The high prices for farm produce have started a strong "forward to the farm" movement, so with a plentiful supply of water and a new tract of good land, which should be opened for filing under the Lahontan Reservoir, the Newlands project would grow and prosper as it should.

Settlement data, Newlands project, Nevada.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	494	540	584	600	610	674
Population.....	1,615	1,867	2,022	2,197	2,225	2,268
Number of irrigated farms.....	494	540	584	600	610	675
Operated by owners or managers.....	439	480	514	525	50	595
Operated by tenants.....	55	60	70	75	80	80
Population.....	1,635	1,887	2,022	2,197	2,225	2,268
Number of towns.....	4	4	4	4	4	4
Population.....	1,250	1,400	1,360	1,860	1,900	2,240
Total population towns and on farms.....	2,885	3,267	3,382	4,057	4,125	4,508
Number of public schools.....	19	20	18	16	14	11
Number of churches.....	8	8	9	7	7	7
Number of banks.....	1	1	1	2	2	2
Total capital stock.....	\$100,000	\$100,000	\$100,000	\$116,000	\$116,000	\$150,000
Amount of deposits.....	\$350,000	\$300,000	\$342,000	\$371,240	\$632,000	\$790,000
Number of depositors.....	650	700	700	775	1,214	1,860

¹ Schools consolidated.

WATER USERS' ACTIVITIES.

On October 8, 1918, following the filing of the necessary bond and fulfilling other requirements, the board of county commissioners of Churchill County, Nev., granted the water users' petition for the organization of an irrigation district under the Nevada State law and called an election for November 16 to allow the landowners and water users an opportunity to indicate their desires in the matter. The result was 256 votes for and 45 votes against the formation of such district, the affirmative votes being sufficient for formation.

The following board of directors was elected for the various divisions: W. A. Pray, Fernley; True Vencil, Old River; W. A. Harmon, Harmon; C. E. Kent, Stillwater; Ben Holmes, Island; C. E. Coe, Sheckler; and Edmund Dietz, Northam. The official name of the organization is the "Truckee-Carson irrigation district."

On December 9, 1918, Edmund Dietz, of the Northam district, was elected president of the board and C. E. Coe, of the Sheckler district, was selected as secretary.

PRINCIPAL CROPS.

Alfalfa continues to be the predominating crop, with grain, potatoes, and garden truck next in order of importance. The fall crop census reported a total of 25,267 acres planted to alfalfa, of which amount 3,725 acres was new seeding planted in 1918. The total yield of 77,442 tons from the old alfalfa was about 6,000 tons in excess of the highest previous record. The maximum yield reported was 7½ tons per acre. Most of the crop was sold in the stack during the summer to stock feeders at prices ranging from \$12 to \$21. Two alfalfa meal mills were erected during the year and have operated continuously since their completion.

Grain consisted, as in previous years, almost exclusively of wheat and barley. The acreage planted to grain in 1918, of 6,522 acres, was about double that planted in 1917. The table of crop yields shown below indicates that the average gross income per acre from grain lands was only \$35.41 for wheat and \$25.97 for barley, as compared with \$57.60 per acre for alfalfa.

Potatoes were not as successful in 1918 as the previous year, due probably to lack of enthusiasm on the part of the growers owing to the uncertain market conditions.

Those farmers having potato storage cellars held over as much of this crop as possible, hoping for better prices in the spring, but were disappointed.

Fruit and garden truck was very profitable owing to the extremely long growing season. Apples and cherries were unusually plentiful, especially apples, of which some 2,000 boxes were marketed. The local markets consumed most of the garden produce except tomatoes, sweet corn, and cantaloupe, which were shipped out in large quantities.

The cantaloupe industry continues to grow in importance each year, one farmer alone shipping out over 500 crates in 1918, which were marketed at fancy prices.

Honey production amounted to 160,000 pounds in 1918, which was sold at about 20 cents per pound as strained honey. Several new apiaries were established during the year.

Dairying and stock raising were at a standstill during the past year. The local creamery after being purchased by the Nevada Packing Co., of Reno, Nev., was discontinued except as a receiving station. The stock-raising industry will probably revive during the coming year or two, owing to the creation of a community pasture of some 15,000 acres in the neighborhood of Carson Lake.

Crop report, Newlands project, Nevada, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre
Alfalfa.....	21,542	Ton.....	77,442	3.60	\$16.00	\$1,239,072	\$57.52
Barley.....	1,374	Bushel....	35,333	25.72	1.08	38,160	27.77
Garden and miscellaneous crops.....	632					44,120	69.81
Oats.....	44	Bushel....	1,813	41.20	.80	1,450	32.96
Potatoes.....	334	do.....	50,833	152.20	.75	38,125	114.11
Wheat.....	5,024	do.....	98,800	19.66	1.80	177,840	35.40
Hay (grass and grain).....	1,124	Ton.....	1,156	1.03	14.00	16,184	14.40
Alfalfa (seeded 1918).....	3,725	do.....	932		16.00	14,912	4.00
Pasture (wild grass).....	9,662					20,140	2.08
Pasture (alfalfa after cut- ting).....						36,139	
Less duplicated areas.....	1,971						
Total cropped acreage.....	41,490	Total and average				1,630,142	153.15
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop.....	821	Total irrigable area farms reported.			60,946	648	29.59
		Total irrigated area farms reported.			42,311	648	20.53
Total irrigated acreage.....	42,311	Total cropped area farms reported..			41,490		20.14

¹ For crops in full production. For all crops, \$39.30.

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, JULY 9, 1918.

1. **Land for which water will be furnished.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that upon proper application being made therefor, water will be furnished under the Truckee-Carson project, Nevada, in the irrigation season of 1918 and thereafter, for the irrigable lands of the NW. $\frac{1}{4}$ of sec. 24, T. 17 N., R. 28 E., M. D. M., shown on a diagram, approved January 4, 1918, by the Reclamation Commission, amendatory of a farm-unit plat of said township approved by the department August 17, 1914. Copies of the amendatory diagram and township plat are on file at the office of the project manager, United States Reclamation Service, at Fallon, Nev., and at the local land office at Carson City, Nev.

2. **Water-right application.**—Water-right application for lands in private ownership shown on said diagram may be made on or after the date of this public notice. The limit for which water-right application may be made for lands in private ownership shall be 160 acres of irrigable land for each land owner.

3. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre

to cover cost of construction of the irrigation system, termed the construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

4. **Construction charge.**—The construction charge shall be \$60 per acre of irrigable land. Five per cent of the construction charge shall be paid at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent installments shall become due and payable on December 1 of each calendar year thereafter.

5. **Increased construction charge in certain cases.**—In all cases where water-right application for lands in private ownership shall not be made within one year after the date of this notice, the construction charge for such lands shall be increased 5 per cent each year until such application is made and an initial installment paid.

6. **Advance payment of construction charge permissible.**—A water-right applicant may, at his option, pay in advance the whole or any part of the construction charge owing by him within any shorter period than that prescribed by this notice.

7. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1918 and thereafter until further notice shall be of the same amount as for other like lands under the same project. Such charge shall be due and payable on March 1 of each calendar year for the preceding irrigation season; but where water-right application is made for land in private ownership after August 1, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

8. **Place and manner of payment of water charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Fallon, Nev., in cash, or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, AUGUST 14, 1918.

1. **Lands for which water will be furnished.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that upon proper application being made therefor, water will be furnished under the Truckee-Carson project, Nevada, in the irrigation season of 1918 and thereafter, for the irrigable lands of lots 1 and 2, sec. 19, T. 19 N., R. 31 E., M. D. M., shown as a part of farm unit "L" on a diagram, approved on the date of this notice by the Reclamation Commission, amendatory of a farm-unit plat of said township approved by the department January 28, 1916. Copies of the amendatory diagram and township plat are on file at the office of the project manager, United States Reclamation Service, at Fallon, Nev., and at the local land office at Carson City, Nev.

2. **Entry for public land.**—Homestead entry for the public lands embraced in the farm unit shown on said plat as amended, and as described above, may be made on and after the date of this notice, at said local land office at Carson City, Nev., if found regular and accompanied by the certificate of the project manager showing that water-right application has been filed and the proper water-right charges deposited.

3. **Limit of area for which water right may be secured.**—The limit of area per entry representing the acreage which in the opinion of the Secretary of the Interior may be reasonably required for the support of a family upon such lands is fixed as shown upon said plat.

4. **Application for water right.**—Water-right application must be made to the project manager, United States Reclamation Service, Fallon, Nev., upon form provided for that purpose. Application must be accompanied by the proper initial water-right payment, which will be accepted by the project manager in the form of New York draft or money order payable to special fiscal agent, United States Reclamation Service, Fallon, Nev., or in currency. Water-right application must be for the specific farm unit.

5. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

6. **Construction charge.**—The construction charge shall be \$60 per acre of irrigable land. Five per cent of the construction charge shall be paid at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent installments shall become due and payable on December 1 of each calendar year thereafter.

7. **Advance payment of construction charge permissible.**—Any water-right applicant may, at his option, pay in advance the whole or any part of the construction charge owing by him within any shorter period than prescribed by this notice.

8. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1918 and thereafter until further notice shall be of the same amount as for other like lands under the said project. Such charge will be due and payable on March 1 of each year for the preceding irrigation season.

9. **Place and manner of payment of water charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Fallon, Nev., in cash, or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

F. C. BRADLEY,
Assistant to the Secretary of the Interior.

ORDER, SEPTEMBER 24, 1918.

The SECRETARY OF THE INTERIOR

(Through the Commissioner of the General Land Office).

SIR: Pursuant to departmental authority of August 27, 1914, there are submitted for your approval, as involving variations in excess of 10 per cent of the irrigable area of each plat, the following proposed changes consisting of the elimination or reduction of the irrigable acreage of various farm units and private lands. This will eliminate from the second unit of the project all (1) unentered public lands, and (2) private lands for which water-right application has not been made.

It is deemed advisable to exclude these lands from entry and irrigation until several factors of uncertainty can be adjusted and afford a reliable basis for computing charges so as to make up the proportionate share of the present deficit in the operation and maintenance charge under the project. Among the matters to be settled are the amount of the Government's storage in Lake Tahoe, the Government's water right in the Truckee River, the removal of the railroad between Lake Tahoe and Truckee City, and the organization of an irrigation district to handle the subject of drainage on this project.

SECOND UNIT—TRUCKEE-CARSON PROJECT, NEVADA.

FARM UNITS.

- T. 19 N., R. 27 E.:
 - Sec. 13, farm units H, J, K, L.
 - Sec. 15, farm units G, H, J.
 - Sec. 22, farm unit B.
 - Sec. 29, farm unit A.
- T. 18 N., R. 28 E.:
 - Sec. 6, farm unit G.
- T. 19 N., R. 28 E.:
 - Sec. 18, farm units G and H.
 - Sec. 19, farm units F, G, H, J, K.
 - Sec. 17, farm unit E.
 - Sec. 20, farm units F, H, K, L.
 - Sec. 21, farm units G, H, J, K.
 - Sec. 24, farm unit H.
 - Sec. 32, farm unit P.
- T. 18 N., R. 29 E.:
 - Sec. 3, farm units C, D, E.
 - Sec. 4, farm units M, N.
 - Sec. 6, farm unit H.
 - Sec. 10, farm units M, N, P.
 - Sec. 12, farm units L, N.
 - Sec. 13, farm units H, K.
- T. 19 N., R. 29 E.:
 - Sec. 8, farm units G, H.
 - Sec. 16, farm unit F.
- T. 19 N., R. 30 E.:
 - Sec. 18, farm unit J.
 - Sec. 23, farm unit N.
 - Sec. 23, farm unit M (and sec. 26).
 - Sec. 23, farm unit L (and sec. 26).
 - Sec. 24, farm units R, N, P.
 - Sec. 27, farm units H, J.
 - Sec. 28, farm units P, Q.
 - Sec. 30, farm units K, L.

PRIVATE LANDS.

T. 19 N., R. 27 E.:

- Sec. 14, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 22, N. $\frac{1}{4}$ NE. $\frac{1}{4}$.
- Sec. 23, NW. $\frac{1}{4}$ NE. $\frac{1}{4}$.
- Sec. 24, W. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ NW. $\frac{1}{4}$, NW. $\frac{1}{4}$ SE. $\frac{1}{4}$.

T. 17 N., R. 28 E.:

- Sec. 1, W. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, lots 3 and 4, S. $\frac{1}{4}$ NW. $\frac{1}{4}$.
- Sec. 12, N. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.
- Sec. 13, NW. $\frac{1}{4}$ NW. $\frac{1}{4}$, S. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ NE. $\frac{1}{4}$.

T. 18 N., R. 28 E.:

- Sec. 1, lot 4, SE. $\frac{1}{4}$ NW. $\frac{1}{4}$.
- Sec. 2, lots 2, 3, and 4, S. $\frac{1}{4}$ NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.
- Sec. 3, lots 1, 2, and 4, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.
- Sec. 10, E. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 11, W. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 12, SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 13, W. $\frac{1}{4}$.
- Sec. 14, NW. $\frac{1}{4}$, N. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 15, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 23, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.
- Sec. 24, NW. $\frac{1}{4}$, E. $\frac{1}{4}$ SE. $\frac{1}{4}$; 30 acres in NW. $\frac{1}{4}$ SE. $\frac{1}{4}$, reducing total area to 10;
8 acres in SW. $\frac{1}{4}$ SE. $\frac{1}{4}$, reducing total area to 30.
- Sec. 25, N. $\frac{1}{4}$ NE. $\frac{1}{4}$, W. $\frac{1}{4}$ NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ SE. $\frac{1}{4}$ NW. $\frac{1}{4}$
(18 acres), SW. $\frac{1}{4}$.

T. 19 N., R. 28 E.:

- Sec. 24, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, S. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 25, W. $\frac{1}{4}$ SW. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ NW. $\frac{1}{4}$.
- Sec. 26, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$; 10 acres in SE. $\frac{1}{4}$ NW. $\frac{1}{4}$, reducing the total area to 17.
- Sec. 27, S. $\frac{1}{4}$ NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.
- Sec. 28, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ SE. $\frac{1}{4}$, S. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 29, E. $\frac{1}{4}$ SE. $\frac{1}{4}$ and W. $\frac{1}{4}$ NW. $\frac{1}{4}$.
- Sec. 30, lot 2, N. $\frac{1}{4}$ NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$.
- Sec. 33, N. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 34, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 35, NE. $\frac{1}{4}$ NE. $\frac{1}{4}$, W. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 36, NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$.

T. 17 N., R. 29 E.:

- Sec. 7, lot 3, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, S. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 8, NW. $\frac{1}{4}$, NW. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 18, lot 1, E. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, NW. $\frac{1}{4}$
SE. $\frac{1}{4}$.

T. 18 N., R. 29 E.:

- Sec. 2, lot 4, S. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 3, lots 1 and 4, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 4, lot 1.
- Sec. 11, 5 acres in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, reducing the total area to 30.
- Sec. 17, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, S. $\frac{1}{4}$ NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$, W. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 18, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 19, 7 acres in lot 1, reducing the total area to 17; 9 acres in lot 2, reducing the total area to 28.

T. 19 N., R. 29 E.:

- Sec. 3, lots 1, 2, 3, 4.
- Sec. 4, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, S. $\frac{1}{4}$ NW. $\frac{1}{4}$, SW. $\frac{1}{4}$.
- Sec. 5, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 8, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, S. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 9, W. $\frac{1}{4}$.
- Sec. 17, E. $\frac{1}{4}$ NE. $\frac{1}{4}$, NW. $\frac{1}{4}$ NE. $\frac{1}{4}$, NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$, S. $\frac{1}{4}$
SW. $\frac{1}{4}$.
- Sec. 19, lot 3, SE. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 20, NW. $\frac{1}{4}$ NW. $\frac{1}{4}$.
- Sec. 28, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$, S. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 29, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 30, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.
- Sec. 31, lots 3 and 4, E. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$.
- Sec. 32, N. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.

T. 19 N., R. 29 E.—Continued.

Sec. 33, N. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$, N. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$.Sec. 34, W. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ SW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, S. $\frac{1}{4}$ SE. $\frac{1}{4}$.Sec. 35, E. $\frac{1}{4}$ NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$.Sec. 36, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$.

T. 19 N., R. 30 E.:

Sec. 1, lot 4, S. $\frac{1}{4}$ NE. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.Sec. 12, NW. $\frac{1}{4}$ NE. $\frac{1}{4}$, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$.Sec. 13, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$.Sec. 14, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SW. $\frac{1}{4}$, NW. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.

T. 19 N., R. 31 E.:

Sec. 6, lots 6 and 7.

Sec. 7, lots 1, 2, 3, and 4, E. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$.Sec. 8, N. $\frac{1}{4}$ NE. $\frac{1}{4}$, SW. $\frac{1}{4}$ NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ NW. $\frac{1}{4}$, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$, S. $\frac{1}{4}$ SW. $\frac{1}{4}$, NW. $\frac{1}{4}$ SE. $\frac{1}{4}$.

It is respectfully recommended that the foregoing eliminations and changes be approved and that the Commissioner of the General Land Office be directed to have the records of his office and of the local land office changed in accordance herewith.

Respectfully submitted.

A. P. DAVIS,
Director and Chief Engineer.

October 1, 1918.

Recommendation approved.

E. C. BRADLEY,
Assistant to the Secretary.

PUBLIC NOTICE, DECEMBER 3, 1918.

1. **Land for which water will be furnished.**—In pursuance of the provisions of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that water will be furnished under the Truckee-Carson project, Nevada, in the irrigation season of 1918 and thereafter, for the irrigable lands of the SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 5, T. 19 N., R. 27 E., M. D. M., in the second unit of said project, shown on a farm-unit plat of said township approved August 17, 1914, and amended on the date of this notice, copies thereof being on file at the office of the project manager, United States Reclamation Service at Fallon, Nev., and at the local land office at Carson City, Nev.

2. **Water-right application for land in private ownership.**—Water-right application for lands in private ownership included in said second unit in the SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 5 may be made on or after the date of this public notice. The limit for which water-right application may be made for lands in private ownership shall be 160 acres of irrigable land for each landowner.

3. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

4. **Construction charge.**—The construction charge shall be \$60 per acre of irrigable land, payable as follows: Five per cent of the construction charge shall be paid at the time of filing water-right applica-

tion, and the remainder of the construction charge shall be paid in 15 annual instalments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual instalments shall become due and payable December 1 of the fifth calendar year after the initial instalment, and subsequent instalments shall become due and payable on December 1 of each calendar year thereafter.

5. **Increased construction charges in certain cases.**—In all cases where water-right application for lands in private ownership shall not be made within one year from the date of this notice, the construction charge for such lands shall be increased 5 per cent each year until such application is made and an initial instalment paid.

6. **Advance payment of construction charges permissible.**—A water-right applicant may, at his option, pay in advance the whole or any part of the construction charge owing by him within any shorter period than that prescribed by this notice.

7. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1918, and thereafter, until further notice, shall be of the same amount as announced for the lands of the Truckee-Carson project in the Fernley and Hazen benches, Truckee-Carson project, in public notice of April 3, 1918. Such charge will be due and payable on March 1 of each year for the preceding irrigation season.

8. **Place and manner of payment of water charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Fallon, Nev., in cash, or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

E. C. BRADLEY,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, MARCH 6, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof, or supplementary thereto, particularly of the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charges for the irrigation season of 1919 and thereafter until further notice against all lands of the Newlands project (formerly Truckee-Carson project), Nevada, under public notice, shall be as follows:

(a) A minimum charge of \$1.40 per irrigable acre will be made whether water is used thereon or not, which charge will permit the delivery of not to exceed 3 acre-feet of water per irrigable acre upon lands of the Fernley and Hazen benches shown upon a map on file in the project office, and not to exceed $1\frac{1}{2}$ acre-feet per irrigable acre upon the other lands of the project; and a charge of 50 cents per acre-foot per irrigable acre will be made for all additional water. These rates do not apply, however, to vested-right lands referred to in subdivision (b) following:

(b) A charge of \$1.50 per acre-foot per irrigable acre will be made for any water in addition to 3 acre-feet per irrigable acre furnished to vested-right land, for which the contract adjusting the vested

acreage provides that the United States is to deliver not to exceed 3 acre-feet per irrigable acre at a fixed charge of 40 cents per acre.

All operation and maintenance charges are due and payable on March 1 of each year for the preceding irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15, or where water-right application is made after August 1 for land in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

The foregoing charges do not cover the water service through the stock-water supply pipes in the Fernley district, the charges for which service will be separately announced.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, APRIL 23, 1919.

1. **Land for which water will be furnished.**—In pursuance of the provisions of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that upon proper water-right application being made therefor, water will be furnished under the Newlands project, Nevada, in the irrigation season of 1919 and thereafter, for the irrigable areas of the following described land, to wit:

LAND IN PRIVATE OWNERSHIP.

W. $\frac{1}{4}$ SE. $\frac{1}{4}$, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 12, T. 17 N., R. 28 E., Mount Diablo meridian.
SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 29, T. 19 N., R. 28 E., Mount Diablo meridian.
N. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 33, T. 19 N., R. 28 E., Mount Diablo meridian.
Lots 3-4, sec. 31, T. 20 N., R. 28 E., Mount Diablo meridian.
E. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 31, T. 20 N., R. 28 E., Mount Diablo meridian.
W. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 31, T. 20 N., R. 28 E., Mount Diablo meridian.

PUBLIC LANDS.

SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 36, T. 20 N., R. 27 E., Mount Diablo meridian.
Lots 1-2, sec. 6, T. 19 N., R. 28 E., Mount Diablo meridian.
Lot 5, SE. $\frac{1}{4}$ NW. $\frac{1}{4}$, S. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 6, T. 19 N., R. 28 E., Mount Diablo meridian.
SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 32, T. 19 N., R. 28 E., Mount Diablo meridian.
Lot 1, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 18, T. 18 N., R. 30 E., Mount Diablo meridian.
SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 23, and
NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 26, T. 19 N., R. 30 E., Mount Diablo meridian.

Diagrams, approved on the date of this notice, show the land above described, and are on file in the office of the project manager at Fallon, Nev., and in the local land office at Carson City, Nev.

2. **Limit of area for which water right may be secured.**—The limit of area of public land per entry, representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such land, is fixed at the amounts shown upon the plats for the several farm units. The maximum limit of area for which water-right application may be made for land in private ownership shall be 160 acres of irrigable land for each land owner.

3. **Water-right application.**—Water-right application must be filed in the office of the project manager. For land in private ownership

such application may be made on and after the date of this notice; for public land such application must be made in accordance with the conditions hereinafter stated.

4. Entry for public land.—Homestead entries may be made at said local land office for all farm units of public land shown on said plats, on and after 9 o'clock a. m., May 8, 1919, by persons holding approved water-right applications. Every person desiring to acquire any of said public land must execute a water-right application upon a form provided for that purpose and accompany the same by payment of the water-right charge, as hereinafter provided. Each water-right application must be for a specified farm unit and more than one person may make such application for the same farm unit, but not more than one water-right application can be made by the same person. Such water-right application must be filed with project manager, United States Reclamation Service, Fallon, Nev., in person, by mail, or otherwise within a period of five days beginning May 3, 1919, to and including 9 o'clock a. m., May 8, 1919. Water-right applications received after said period of five days will be filed and noted in the order of their receipt.

5. Simultaneous filing of water-right applications.—Water-right applications made and filed with the project manager during said five-day period will be held and treated as simultaneously filed and the project manager will dispose of them as follows:

(a) Where there is no conflict the water-right application will be approved by the project manager.

(b) Where there are two or more water-right applications for the same farm unit the project manager will write on cards the names of the several water-right applicants, and each of those cards containing the name of one such applicant will be placed in an envelope upon which there is no distinctive or identifying mark, and at 2 o'clock p. m., May 8, 1919, after all the envelopes containing the names of the several water-right applicants shall have been thoroughly mixed in the presence of such persons as may desire to be present, they will be drawn and numbered in order. The cards as drawn and numbered will be securely fastened to the water-right applications of the respective persons, and the water-right applications will be approved in such order by the project manager.

6. Approved water-right applications.—Approval by the project manager of a water-right application for public land will entitle the water-right applicant to file homestead application at said local land office, for the farm unit described in his water-right application. Such homestead application should be made within four days from date of approval of water-right application. Failure to so make such homestead application, will entitle the water-right applicant next in order for the same unit to have his water-right application approved by the project manager allowing him to make homestead application, this procedure continuing, if necessary, as to all applicants. No part of a payment made will be returned to a successful applicant in any case, if he be a qualified homestead entryman.

7. Failure of applicant to obtain public land applied for.—Where any applicant fails to obtain public land applied for by him he will be permitted to elect whether he will amend his application to embrace other land not affected by pending applications and otherwise subject thereto when such amended application is presented, or withdraw

his original application without prejudice. In the event of such withdrawal the water-right charges deposited will be returned by the project manager upon surrender of the receipt therefor.

8. **Warning against unlawful settlement upon public land.**—No person will be permitted to gain or exercise any right whatever under any settlement or occupation of any of said public land, begun without having at the time, a valid approved water-right application covering the land in question; provided, however, that this shall not affect any valid existing right obtained by settlement or entry while the land was subject thereto.

9. **Classes of charges of water right.**—The water-right charges against all of said lands are of two kinds, to wit: (a) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge, and (b) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

10. **Construction charge.**—The construction charge for said land shall be \$60 per irrigable acre. An initial payment of 5 per cent of the construction charge shall be made at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent installments shall become due and payable on December 1 of each calendar year thereafter.

11. **Advance payment of construction charge permissible.**—Any water-right applicant or entryman may, if he so elect, pay the whole or any part of the construction charge owing by him within any shorter period than that provided by the public notices and orders applicable to his land.

12. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice, shall be of the same amount as for other like land under the same project. Such charge will be due and payable on March 1 of each year for the preceding irrigation seasons; but where water-right application is made for public land entered under the reclamation law after June 15, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

13. **Place and manner of payment of water charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Fallon, Nev., in cash or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

14. **All land to be included in irrigation district.**—The water-right applications for all land covered by this public notice not now within the Truckee-Carson irrigation district, and which may be now or hereafter lawfully brought thereunder, shall contain the following provision:

The applicant agrees for himself and his successors to take appropriate steps in conformity with the laws of the State of Nevada, to have the land above described included within the Truckee-Carson irrigation district. If, for 30 days after notice is given him or his

successor by the project manager of the Newlands project, to take any of such steps, he or his successor fails so to do, this water-right application may, at the option of the Secretary of the Interior, be canceled, with the forfeiture of all rights acquired thereunder and of all payments made thereon.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, MAY 31, 1919.

1. Land for which water will be furnished.—In pursuance of the provisions of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, notice is hereby given that upon proper water right application being made therefor, water will be furnished under the Newlands project, Nevada, in the irrigation season of 1919 and thereafter, for the irrigable areas of the following described land, to wit:

LAND IN PRIVATE OWNERSHIP.

Lots 1, 2, 3, 4, and 5, sec. 17, T. 17 N., R. 29 E., M. D. M.
NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ SE. $\frac{1}{4}$, and SW. $\frac{1}{4}$ SE. $\frac{1}{4}$, sec. 24, T. 19 N., R. 26 E., M. D. M.
NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, sec. 24, T. 18 N., R. 28 E., and lot 3, sec. 19, T. 18 N., R. 29 E.,
M. D. M.
NW. $\frac{1}{4}$ NE. $\frac{1}{4}$, sec. 30, T. 19 N., R. 28 E., M. D. M.

PUBLIC LAND.

Lot 6, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$, sec. 6, T. 19 N., R. 28 E., M. D. M.
SE. $\frac{1}{4}$, sec. 6, T. 19 N., R. 28 E., M. D. M.
E. $\frac{1}{4}$ SE. $\frac{1}{4}$, sec. 31, T. 20 N., R. 28 E., M. D. M.
SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ and W. $\frac{1}{4}$ SE. $\frac{1}{4}$, sec. 5, T. 19 N., R. 28 E., M. D. M.

Diagrams, approved on the date of this notice, show the land above described, and are on file in the office of the project manager at Fallon, Nev., and in the local land office at Carson City, Nev.

2. Limit of area for which water right may be secured.—The limit of area of public land per entry, representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such land, is fixed at the amounts shown upon the plats for the several farm units. The maximum limit of area for which water-right application may be made for land in private ownership shall be 160 acres of irrigable land for each land owner.

3. Water-right application.—Water-right application must be filed in the office of the project manager. For land in private ownership such application may be made on and after the date of this notice; for public land such application must be made in accordance with the conditions hereinafter stated.

4. Entry for public land.—Homestead entries may be made at said local land office for all farm units of public land shown on said plats, on and after 9 o'clock a. m., June 19, 1919, by persons holding approved water-right applications. Every person desiring to acquire any of said public land must execute a water-right application upon a form provided for that purpose and accompany the same by payment of the water-right charge as hereinafter provided. Each water-right application must be for a specified farm unit and more than one

person may make such application for the same farm unit, but not more than one water-right application can be made by the same person. Such water-right application must be filed with project manager, United States Reclamation Service, Fallon, Nev., in person, by mail, or otherwise within a period of five days beginning June 14, 1919, to and including 9 o'clock a. m., June 19, 1919. Water-right applications received after said period of five days will be filed and noted in the order of their receipt.

5. **Simultaneous filing of water-right applications.**—Water-right applications made and filed with the project manager during said five-day period will be held and treated as simultaneously filed and the project manager will dispose of them as follows:

(a) Where there is no conflict the water-right application will be approved by the project manager.

(b) Where there are two or more water-right applications for the same farm unit the project manager will write on cards the names of the several water-right applicants, and each of those cards containing the name of one such applicant, will be placed in an envelope upon which there is no distinctive or identifying mark, and at 2 o'clock p. m., June 19, 1919, after all the envelopes containing the names of the several water-right applicants shall have been thoroughly mixed in the presence of such persons as may desire to be present they will be drawn and numbered in order. The cards as drawn and numbered will be securely fastened to the water-right applications of the respective persons, and the water-right applications will be approved in such order by the project manager.

6. **Approved water-right applications.**—Approval by the project manager of a water-right application for public land will entitle the water-right applicant to file homestead application at said local land office for the farm unit described in his water-right application. Such homestead application should be made within four days from date of approval of water-right application. Failure to so make such homestead application, will entitle the water-right applicant next in order for the same unit to have his water-right application approved by the project manager allowing him to make homestead application, this procedure continuing if necessary as to all applicants. No part of a payment made will be returned to a successful applicant in any case, if he be a qualified homestead entryman.

7. **Failure of applicant to obtain public land applied for.**—Where any applicant fails to obtain public land applied for by him he will be permitted to elect whether he will amend his application to embrace other land not affected by pending applications and otherwise subject thereto when such amended application is presented, or withdraw his original application without prejudice. In the event of such withdrawal the water-right charges deposited will be returned by the project manager upon surrender of the receipt therefor.

8. **Warning against unlawful settlement upon public land.**—No person will be permitted to gain or exercise any right whatever under any settlement or occupation of any of said public land, begun without having at the time a valid approved water-right application covering the land in question; provided, however, that this shall not affect any valid existing right obtained by settlement or entry while the land was subject thereto.

9. Classes of charges for water right.—The water-right charges against all of said land are of two kinds, to wit: (a) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge, and (b) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

10. Construction charge.—The construction charge for said land shall be \$60 per irrigable acre. An initial payment of 5 per cent of the construction charge shall be made at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent, and the remainder each 7 per cent of the total construction charge. The first of the said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent installments shall become due and payable on December 1 of each calendar year thereafter.

11. Advance payment of construction charge permissible.—Any water-right applicant or entryman may, if he so elects, pay the whole or any part of the construction charge owing by him within any shorter period than that provided by the public notices and orders applicable to his land.

12. Operation and maintenance charge.—The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice, shall be of the same amount as for other like land under the said project. Such charge will be due and payable on March 1 of each year for the preceding irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15, no operation and maintenance charge will be made for water delivered, during the remainder of the irrigation season in which the water-right application is made.

13. Place and manner of payment of water charges.—All water-right charges must be paid at the office of the United States Reclamation Service at Fallon, Nev., in cash or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

14. All land to be included in irrigation district.—The water-right applications for all land covered by this public notice not now within the Truckee-Carson irrigation district, and which may be now or hereafter lawfully brought thereunder, shall contain the following provision:

The applicant agrees for himself and his successors to take appropriate steps in conformity with the laws of the State of Nevada, to have the land above described included within the Truckee-Carson irrigation district. If for 30 days after notice is given him or his successor by the project manager of the Newlands project, to take any of such steps, he or his successor fails so to do, this water-right application may at the option of the Secretary of the Interior be canceled with the forfeiture of all rights acquired thereunder and of all payments made thereon.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Newlands project, June 30, 1919.

Cash.....	\$15,533.43
Inventory of materials and supplies on hand.....	38,951.37
Accounts receivable:	
Current accounts due.....	24,241.70
Construction water-right charges unaccrued.....	1,013,095.80
Construction work contracted.....	8,250.00
Gross construction cost.....	\$6,384,544.40
Less construction revenue earnings.....	14,402.67
Net construction cost.....	6,370,141.73
Gross operation and maintenance cost.....	631,600.42
Less operation and maintenance earnings.....	14,345.12
	617,255.30
Accounts payable.....	37,751.35
Contingent obligations.....	23,783.43
Collections and contracts of specific amounts for repayments to reclamation fund.....	1,885,715.43
Capital investment:	
Disbursement, transfer, and joint-construction vouchers received.....	7,232,763.12
Collection, transfer, refund, and joint-construction vouchers issued.....	1,052,554.50
Net investment.....	6,180,208.62

Feature costs of Newlands project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Pyramid division.....		\$15,909.88
Truckee division.....		19,536.44
Fallon division.....	\$840.44	134,464.93
Loveloek Branch.....		11,648.79
Churchill Valley unit.....		18,788.27
Reno Valley.....		3,847.64
Upper Carson Valley.....	7,504.62	32,256.69
Truckee River water-right adjudication.....	9,282.43	40,856.00
	17,627.49	277,308.64
Storage system:		
Lahontan Reservoir.....	14,844.44	1,468,823.41
Lake Tahoe storage.....	24,454.74	196,552.63
	39,299.18	1,665,376.04
Canal system:		
Diversion Dam and main Truckee Canal to Pyramid headworks.....		608,084.02
Main Truckee Canal—Pyramid headworks to Lahontan Dam.....	13,260.83	1,026,501.77
Carson diversion dam.....		93,578.52
V Line Canal.....	6.99	446,552.84
T Line Canal.....	2,179.72	76,695.88
	15,447.54	2,251,413.03
Lateral system:		
Truckee Canal laterals.....	1,168.06	115,110.17
Fernley stock water pipe line.....	1,571.14	26,241.41
V line laterals.....	7,016.25	926,343.82
T line laterals.....	5,456.94	139,973.10
System of waste-water ditches.....		249,941.24
	13,070.11	1,457,608.74
Drainage system:		
Drainage investigations.....	13,049.66	34,241.57
Fernley drain.....	1,295.74	23,866.98
Deep tile drains.....		31,397.75
V line drainage.....	8,154.00	20,012.15
	20,907.92	109,518.45
Flood protection: Carson River channel.....		131,821.37
Power system:		
Commercial power system.....		26,346.65
Lahontan power house.....		138,511.52
		164,858.17

¹ Deduct.² Gross cost for year, \$9.40; credit, freight adjustments, \$580.54; net credit for year, \$571.14.³ Gross cost for year, \$809.61; credit, materials returned to storehouse, \$1,105.35; net credit for year, \$295.74.

Feature costs of Newlands project—Continued.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Farm units:		
Surveys and miscellaneous.....	\$2,983.75	\$26,363.07
Leveling farm lands under contract.....	20,460.63	23,839.92
Leveling farm lands under public notice.....	467.14	40,600.08
Settlement vested water rights.....	1,956.77	11,367.31
	25,868.29	102,169.38
Permanent improvements:		
Experimental farm.....		7,008.44
Headquarters and permanent buildings.....	19,213.68	39,131.11
Ditchriders' and gatetenders' houses.....	2,556.66	28,741.03
Lands purchased.....		9,008.85
Government stock pasture.....	65.05	312.24
	21,834.39	84,201.67
Telephone system.....	138.29	42,653.95
Operation and maintenance charges transferred to and compounded with construction charges.....		2,022.98
Gross cost of construction features.....		6,288,953.37
Balance in plant accounts.....		95,591.03
Gross cost to June 30, 1919.....	154,193.21	6,384,544.40
Less revenue earned during construction period:		
Rental of buildings.....	260.00	17,944.11
Rental of grazing and farming lands.....	1,202.61	21,239.79
Contractors' freight refunds.....	320.80	732.87
Loss on hospital operations.....	¹ 104.32	¹ 2,153.94
Loss on farming operations.....	9,656.94	¹ 2,683.98
Loss on other operations, unclassified.....	¹ 14,108.74	¹ 20,676.18
	¹ 2,772.71	14,402.67
Net construction cost, June 30, 1919.....	156,965.92	6,370,141.73

¹ Deduct.*Statement of costs, by calendar years, Newlands project.*

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending Dec. 31—			
1902 to 1907.....	\$3,722,316.15	\$90,431.57	\$3,812,747.72
1908.....	17,221.04	60,177.33	77,398.37
1909.....	1,976.89	113,602.14	115,579.03
1910.....	80,572.19	39,188.87	119,761.06
1911.....	365,373.25	48,325.21	413,698.46
1912.....	668,324.06	¹ 108,989.11	559,334.95
1913.....	467,588.32	53,331.13	520,919.45
1914.....	456,192.82	45,902.61	502,095.43
1915.....	173,952.21	49,107.20	223,059.41
1916.....	22,826.29	47,774.45	70,600.74
1917.....	73,784.50	48,025.03	121,809.53
1918.....	162,394.39	86,719.10	249,113.49
January to June 30, 1919.....	79,386.04	58,604.59	137,990.63
Subtotal.....	6,288,953.37		6,920,553.79
Plant accounts on June 30, 1919.....	95,591.03		95,591.03
Total.....	6,384,544.40	631,800.42	7,016,344.82

¹ Deduct.

Statement of costs, by fiscal years, Newlands project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending June 30—			
1902 to 1907.....	\$3,573,134.35	\$67,105.07	\$3,640,239.42
1908.....	242,801.86	57,716.00	300,517.86
1909.....	^{1,2} 107,049.46	124,066.40	17,006.94
1910.....	69,945.22	34,870.69	104,815.91
1911.....	138,866.51	47,123.04	185,989.55
1912.....	671,617.45	¹ 110,123.29	561,495.16
1913.....	454,587.53	52,354.98	506,942.51
1914.....	514,930.03	44,610.78	559,540.81
1915.....	400,371.22	46,313.22	446,684.44
1916.....	¹ 10,336.99	49,973.91	39,636.92
1917.....	46,610.29	33,181.45	79,791.74
1918.....	139,282.15	79,790.56	219,072.71
1919.....	154,193.21	104,626.61	258,819.82
Subtotal.....	6,288,953.37	.....	6,920,553.79
Plant accounts on June 30, 1919.....	95,591.08	.....	95,591.03
Total.....	6,384,544.40	631,600.42	7,016,144.82

¹ Deduct.² Portion of flood expense transferred to operation and maintenance.*Estimated cost of contemplated work, Newlands project, during fiscal year 1920.*

Features.	Subfeature.	Principal feature.
Examination and surveys.....	.....	\$10,500
Storage system: Lake Tahoe settlement and Truckee River channel surveys.....	.....	53,200
Canal system:		
Truckee canal.....	\$5,500	.....
T line canal.....	1,250	.....
Installation of structures.....	5,150	.....
		11,900
Lateral system:		
Surveys.....	1,000	.....
V system laterals to serve Freeman ranch.....	23,000	.....
Downs lateral.....	2,500	.....
Minor lateral extensions.....	11,100	.....
		37,600
Drainage system.....	.....	1,000
Farm units.....	.....	5,800
Permanent improvements:		
Completion of project shops and yards at Fallon.....	10,000	.....
Improvements to ditchriders' stations.....	1,000	.....
		11,000
Operation and maintenance under public notice.....	.....	86,000
Reimbursable accounts.....	.....	2,000
Total.....	.....	219,000

250 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating cost and revenues, Newlands project, to Dec. 31, 1918.

Feature.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works:						
Lake Tahoe Reservoir.....	1,2 \$845.51	1,2 \$11.28	1,2 \$856.79	\$3,818.34	\$56.74	\$3,875.08
Lahontan Dam.....	3,841.36	679.93	4,521.29	9,611.35	4,092.38	13,703.73
	2,995.85	668.65	3,664.50	13,429.69	4,149.12	17,578.81
Canal systems:						
Truckee Canal.....	1,2 200.43	1,2 238.85	1,2 439.28	13,006.87	21,290.88	34,297.75
V line canal.....	2,049.58	8,700.26	10,749.84	13,923.90	26,725.74	40,649.64
T line canal.....	688.55	988.33	1,676.88	1,748.24	8,999.37	10,747.61
	2,537.70	8,449.74	10,987.44	28,679.01	57,015.99	85,695.00
Lateral system:						
Truckee Canal district.....	2,810.31	17,492.25	20,302.56	19,508.93	56,239.15	75,748.08
V district.....	6,750.45	33,969.67	40,720.12	96,621.43	182,071.63	278,693.06
T line canal district.....	819.21	4,318.55	5,137.76	17,004.47	39,249.46	56,343.93
Waste-water ditches.....				629.01	47,139.24	47,768.25
	10,379.97	55,780.47	66,160.44	133,853.84	324,699.48	458,553.32
Drainage system:						
Truckee district surface drains.....		43.56	43.56		43.56	43.56
V district surface drains.....		3,380.69	3,380.69		4,044.28	4,044.28
V district subsurface drains.....		8.80	8.80	717.29	1,090.99	1,808.28
		3,433.05	3,433.05	717.29	5,178.83	5,896.12
Flood protection: Carson River channel.....					2,148.77	2,148.77
Undistributed expenses:						
Maintenance ditch riders' houses.....		2,473.67	2,473.67		2,759.47	2,759.47
Betterment, year 1914, charged to maintenance.....					2,386.97	2,386.97
		2,473.67	2,473.67		5,146.44	5,146.44
Gross cost.....	15,913.52	70,805.58	86,719.10	176,679.83	398,338.63	575,018.46
Less accrued and unpaid operation and maintenance accruals transferred to and added to construction charges.....						1,022.93
Net cost.....	15,913.52	70,805.58	86,719.10	176,679.83	398,338.63	572,995.53
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			73,583.34			372,715.57
Operation and maintenance charges paid in advance by water-right applicants.....			1,308.85			42.70
Operation and maintenance charges paid and forfeited by water-right applicants.....			261.34			1,502.21
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			936.77			3,090.37
Rental of land and buildings during operating period.....			1,523.00			3,402.17
Rentals of irrigation water.....			826.78			8,612.90
Other revenues, unclassified, earned during operating period.....						906.08
Less discounts allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			1,243.58			1,325.41
Total.....			75,578.80			387,045.50
Difference (deficit).....			11,140.30			185,949.94

¹ Deduct.

² Credits due to adjustment between operation and maintenance and power revenues for years 1915 to 1917, inclusive.

NEW MEXICO, CARLSBAD PROJECT.

L. E. FOSTER, project manager, Carlsbad, N. Mex.

LOCATION.

County: Eddy.

Townships: 18 to 24 S., Rs. 25 to 29 E., New Mexico meridian.

Railroad: Atchison, Topeka & Santa Fe System.

Railroad stations and estimated population, June 30, 1919: Carlsbad, 3,000; Otis, 50; Loving, 250; Malaga, 75.

WATER SUPPLY.

Source of water supply: Pecos River.

Area of drainage basin: 22,000 square miles.

Annual run-off in acre-feet of Pecos River at Carlsbad and Dayton (22,000 square miles) 1899 to 1918: Maximum, 912,000; minimum, 136,500; mean, 280,770 since 1905.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 24,990.6 acres.

Area under water-right applications, season of 1919: 23,869 acres.

Length of irrigating season: From March to November and two weeks in winter, 260 days.

Average elevation of irrigable area: 3,100 feet above sea level.

Rainfall on irrigable area: 1901-1918, average 14.27 inches; 1918, 7.86 inches.

Range of temperature on irrigable area: -7° to 110° F.

Character of soil of irrigable area: Pecos sandy loam with large lime content.

Principal products: Alfalfa, cotton, grain crops, melons, peaches, pears, and miscellaneous fruits.

Principal markets: Carlsbad, N. Mex.; Denver, Colo.; Chicago, Ill.; Kansas City, Mo.; Texas cities; New York, N. Y.

LANDS OPENED FOR IRRIGATION.

Dates of public notices: December 17, 1907; November 30, 1908; June 2, November 17, 1909; October 7, 1910; March 13, 1911; February 17, 1912; March 2, April 10, 1915; February 24, September 2, 1916; March 9, 1917; March 12, 1918; March 11, June 24, 1919.

Location of lands opened: Ts. 21, 22, 23, and 24 S., Rs. 26, 27, 28, and 29 E., New Mexico meridian.

Duty of water: 2.43 acre-feet per acre per annum at the farm, 1918.

Building charge per acre of irrigable land: \$31, \$45, \$55, \$60, and \$69.

Annual operation and maintenance charges on graduated scale according to use. For 1919, first acre-foot, \$1.40; second acre-foot, 20 cents; third acre-foot, 25 cents; fourth acre-foot, 50 cents; additional acre-feet, 75 cents per acre-foot. Waste water furnished from January 1 to March 10, 1919, at 15 cents per acre-foot.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1904.

Construction recommended by board of engineers August 31, 1905.

Construction authorized by Secretary February 24, 1906.

Canal system of Pecos Irrigation Co. purchased February, 1906.

First irrigation by Reclamation Service, season 1907.

Construction completed at Avalon diversion, 1912.

Project 97 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Carlsbad project provides for the storage of water in Lake McMillan, on Pecos River, near Lakewood, N. Mex., and in a storage and distributing reservoir on the same river near Carlsbad, N. Mex., controlled by Avalon Dam; and the diversion of water from Avalon Reservoir into a canal system, watering lands on both sides of Pecos River, in the vicinity of Carlsbad. The United States claims all waste, seepage, unappropriated spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The major construction features of the project were completed in 1912, the principal of which are: The Avalon Dam, which has a concrete core wall; McMillan, an earth and rock fill dam, which was built by private capital, antedating Government control; a concrete flume spanning the Pecos River, with 4 arches of 100 feet each; a reinforced concrete siphon, under Dark Canyon, 6 feet in diameter, originally 400 feet long, which was lengthened to 600 feet in 1916; about 50 miles of canals and laterals (exclusive of sublaterals and ditches); a concrete head-gate structure at each of the dams, and two spillway tunnels driven through rock, each 21 feet in diameter, lined with concrete, aggregating 200 feet in length, equipped with heavy cylindrical gates operated by turbines (replacing concrete spillway equipped with wooden emergency gates, spillway having been closed with concrete); and a reinforced concrete circular spillway 393 feet long. All check gates, spillways, and head-gate structures on the canals and all turnouts on the laterals are of concrete construction.

SUMMARY OF GENERAL DATA FOR CARLSBAD PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	24, 991
Public land entered to June 30, 1919.....	166
Private land June 30, 1919.....	24, 825
Acreage service could have supplied in season of 1918.....	24, 990. 6
Estimated acreage service can supply in season of 1919.....	24, 990. 6
Estimated acreage service can supply in season of 1920.....	24, 990. 6
Acreage irrigated season of 1918.....	19, 460
Acreage cropped under irrigation season of 1918.....	18, 200

Crops:

Value of irrigated crops, season of 1918.....	\$1, 105, 515. 00
Value of irrigated crops, per acre cropped.....	\$60. 74

Finances:

Net construction cost to June 30, 1919.....	\$1, 369, 838. 88
Per cent completed on June 30, 1919.....	97
Appropriated for fiscal year 1920.....	\$81, 000. 00
Estimated per cent complete by June 30, 1920.....	97
Proposed appropriation for fiscal year 1921.....	\$108, 000. 00
Estimated per cent complete by June 30, 1921.....	97
Announced construction charges per acre.....	\$31, \$45, \$55, \$60, \$69

Appropriation fiscal year 1919.....	\$75, 000. 00
Increase miscellaneous collections and transfers.....	17, 846. 02
Increased compensation.....	3, 462. 08
	<u>\$96, 308. 10</u>

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$47, 030. 92
Current liabilities.....	5, 337. 58
Contingent liabilities.....	25. 00
	<u>\$52, 393. 50</u>

Unencumbered balance on July 1, 1919..... \$43, 914. 60

Repayments:

Value of construction water-right contracts.....	<u>\$1, 339, 290. 00</u>
--	--------------------------

Construction charges—

Accrued to June 30, 1919.....	\$221, 963. 30
Collected to June 30, 1919.....	\$207, 956. 79

Uncollected on June 30, 1919..... \$14, 006. 51

Operation and maintenance charges (public notice):

Accrued to June 30, 1919.....	¹ \$240, 308. 89
Collected to June 30, 1919.....	\$227, 609. 98

Uncollected on June 30, 1919..... \$12, 698. 91

¹ Accruals per balance sheet, \$239,639.89; accruals for operation and maintenance supplemental construction charges, \$669: total, \$240,308.89.

Repayments—Continued.**Water rental charges—**

Accrued to June 30, 1919.....	\$14, 483. 23
Collected to June 30, 1919.....	\$14, 424. 28
Uncollected on June 30, 1919.....	\$58. 95

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	5, 000
Miles of drains built to June 30, 1919—	
Open.....	11. 14
Closed.....	3. 65
	14. 79
Estimated acreage protected by drains to June 30, 1919.....	5, 500
Estimated acreage to be protected by authorized system.....	5, 500
Cost of drainage works to June 30, 1919.....	\$132, 727. 83

CONSTRUCTION DURING FISCAL YEAR.

Construction work was confined to the completion of open drain D, which is located in the Loving area; 1,675 linear feet of this drain were constructed during the fiscal year. The lower 2 feet of the total depth was in a highly cemented gypsum clay, which had to be broken with powder. The cost of excavation was 18.4 cents per cubic yard for the completed ditch. All work was stopped on July 19, 1918, due to shortage of the construction funds.

Lateral system.—A few necessary farm turnouts and lateral extensions built during the fiscal year were charged to operation and maintenance.

SEEPAGE AND DRAINAGE.

Seepage conditions continued to improve until the latter part of the fiscal year. In two areas, one immediately south of the town of Loving, containing about 2 sections of land, and another between the main canal and the lower part of Cass Draw, containing about 3½ sections, about 4 miles south of Otis, the water table was appreciably rising. Considerable land in both of these areas has been out of cultivation most of the time for several years, due to the uncertainty of profitable production. Adequate drainage should be provided for these areas at an early date. A small area containing about 120 acres about 3 miles east of Loving, which is tributary to D drain, should also be more adequately protected. Areas tributary to constructed drains which were seeped badly two years ago are now producing maximum crops for the most part.

OPERATION AND MAINTENANCE.

Storage in the reservoirs was entirely used at the beginning of the fiscal year. Late spring frosts in 1918 killed all fruit, and annual crops were not well started until near the 1st of June. The season was unusually dry over the entire watershed of the Pecos River; the precipitation for the season of 1918 amounted to 7.86 inches, which assisted but little in the maturing of crops. The water supply was not sufficient to mature maximum crops of alfalfa for the second and third cuttings in 1918, although a good seed crop was raised when the second crop was left for that purpose. Upon the whole, the season may be considered more nearly normal than the preceding one. The annual run-off of the Pecos for 1918 was 180,850 acre-feet, most of which occurred late in the season.

Maintenance work consisted of the usual cleaning and repair work during the winter and early spring of 1918-19. Severe spring winds caused about \$15,000 of damage on the east embankment at Lake McMillan. The riprap on that embankment was badly damaged and maintenance work was in progress at that point at the end of the fiscal year, with the job about 35 per cent completed.

Historical review, Carlsbad project.

Item.	1913	1914	1915	1916	1917	1918
Acres for which service was prepared to supply water.....	20,261	20,261	24,796	24,775	24,775	24,990.6
Acres irrigated.....	14,260	12,690	13,470	16,600	16,882	19,460
Miles of canal operated.....	45	45	45	45	45	45
Water diverted (acre-feet).....	86,560	87,900	79,530	105,470	65,196	98,920
Water delivered to land (acre-feet).....	33,044	30,900	28,857	40,382	39,589	47,380
Per acre of land irrigated (acre-feet).....	2.32	2.44	2.14	2.43	2.33	2.43

NOTE.—All of the above data as of Dec. 31, each year.

SETTLEMENT.

A considerable percentage of new land has been added to the irrigable area. This land is being improved largely by local people, in part by farmers who are increasing their holdings and in part by local business men, who are purchasing farms and making permanent improvements. Very few new settlers from other communities have bought lands, although one large ranch was bought recently by a farmer from a small settlement near Lake Arthur, 60 miles north.

Settlement data, Carlsbad project.

Item.	1913	1914	1915	1916	1917	1918
Total number of farms on project....	1 525	1 503	1 524	1 595	1 627	1 660
Population.....	910	541	912	634	992	1,257
Number of irrigated farms.....	362	390	325	455	535	458
Operated by owners or managers.....	224	193	149	1 167	1 190	231
Operated by tenants.....	138	110	176	83	243	227
Population.....	910	541	912	634	992	1,257
Number of towns.....	4	4	4	4	4	4
Population.....	3,000	3,000	3,000	3,300	3,300	3,375
Total population in towns and on farms.....	3,910	3,541	3,912	3,934	4,292	4,632
Number of public schools.....	7	7	7	7	7	7
Number of churches.....	8	8	8	8	8	8
Number of banks.....	2	2	2	3	3	3
Total capital stock.....	\$80,000	\$80,000	\$80,000	\$225,000	\$275,000	\$ 275,000
Amount of deposits.....	\$547,000	\$687,000	\$1,243,316	\$1,271,266	\$1,238,432	\$ 1,238,432
Number of depositors.....	1,400	1,484	2,138	1,941		2,234

All the above data as of Dec. 31, each year.

¹ Water-right applications.

² Many farms were operated by 1 man.

³ As of June 30, 1919.

PRINCIPAL CROPS.

The principal crops are alfalfa and cotton. Crop results for the season of 1918 were very satisfactory on the whole and may be found in the appended table. Although an inadequate water supply at a critical period affected alfalfa hay production, an extra long season made up in a large measure the shortage of water for cotton, so that the yield of that crop was about the average of past years. The

business of dairying on the project is relatively unimportant; in fact, has shown some decrease over past years.

The June, 1919, crop acreage report shows a gain in acreage over 1918 of about 2,000 acres. The increase was largely in that of cotton, which shows a gain of about 28 per cent. The alfalfa acreage was about the same as in 1918.

Crop conditions in 1919 were unusually good. The dry electric winds usual in the spring were largely lacking, and there was more humidity than usual. A March rise down the river was followed by a largely increased stream flow, which was constant until the end of June. The irrigation water was of better quality than usual. The unit yield of alfalfa hay was much larger than the average, although the average quality was not quite so good, due to heavy dews bleaching the hay during the process of curing. The cotton crop was further advanced than usual and in fine condition at the end of June. Work on the farms was somewhat delayed on account of the shortage of labor.

Crop report, Carlsbad project, New Mexico, 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	6,435	Tons.....	12,679	1.97.	\$24.47	\$310,474	\$48.24
Alfalfa seed.....	2,754	Pounds.....	456,671	166	.134	61,181	22.21
Barley.....	235	Bushels.....	1,860	7.9	1.13	2,655	11.30
Beans.....	36	do.....	144	4	4.78	688	19.11
Cane.....	528	Tons.....	835	1.58	16.45	13,750	26.05
Corn, fodder.....	300	do.....	268	.89	12.08	3,235	10.78
Corn, Indian.....	508	Bushels.....	7,125	14	1.76	12,517	24.64
Corn, sorghum.....	392	do.....	9,335	23.8	2.08	19,430	49.57
Cotton.....	7,147	Pounds.....	1,808,645	253	.272	491,987	68.84
Cotton seed.....	7,147	Tons.....	1,590	.223	61.00	96,990	13.55
Garden.....	25					1,350	52.93
Hay and straw.....	1,730	Tons.....	865	.5	8.00	6,920	4.00
Oats.....	91	Bushels.....	1,236	13.6	.89	1,098	12.06
Pasture.....	3,689	Acres.....				54,114	14.65
Potatoes, sweet.....	10	Pounds.....	62,400	6,240	.05	3,120	312.00
Wheat.....	1,345	Bushels.....	12,171	9	1.95	23,691	17.61
Miscellaneous.....	141					2,315	16.45
Less duplicated areas.....	14,313						
Total cropped acreage.	18,200	Total and average.....				1,105,515	60.74
		Areas.	Acres.	Farms.	Per cent of project.		
Acreage irrigated without crop.....	1,260	Irrigable area farms reported.....	24,775	458	100		
Total irrigated acreage.....	19,400	Irrigated area farms reported.....	19,460	458	78		
		Under water-right applications.....	19,460	458	78		
		Cropped area farms reported.....	18,200	458	73		

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, MARCH 11, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charge for the irrigation season of 1919 and thereafter until

further notice against all lands of the Carlsbad project, New Mexico, under public notice, shall be a minimum charge of \$1.40 per irrigable acre, whether water is used thereon or not, which charge will permit the delivery of not to exceed 1 acre-foot of water per irrigable acre; for the first acre-foot per irrigable acre additional the charge shall be 20 cents per acre-foot; for the second acre-foot per irrigable acre additional, 25 cents; for the third acre-foot per irrigable acre additional, 50 cents; and for further quantities, 75 cents per acre-foot. An additional charge of 15 cents an acre-foot will be made for water used in the winter season beginning at the close of the irrigation season and ending March 10, which water would otherwise waste over the spillways at Lake Avalon. All operation and maintenance charges will be due and payable on March 1 of each year for the preceding irrigation season.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, JUNE 24, 1919.

1. **Lands for which water will be furnished.**—Upon proper application being made therefor, water will be furnished under the Carlsbad project, New Mexico, in the irrigation season of 1919 and thereafter for the irrigable lands of the third unit of said project, shown on farm unit plats of the following townships of the New Mexico principal meridian, to wit, T. 22 S., R. 27 E.; T. 23 S., R. 27 E.; T. 22 S., R. 28 E.; T. 23 S., R. 28 E.; T. 24 S., R. 28 E.; which plats were approved by the department on the date of this notice, and are on file in the office of the project manager, United States Reclamation Service, Carlsbad, N. Mex., and the local land office at Roswell, N. Mex.

2. **Limit of area for which water right may be secured.**—The limit of area per entry representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family upon such lands, is fixed at the amount shown upon the plats for the several farm units. The maximum limit of area for which water-right application may be made for lands in private ownership shall be 40 acres of irrigable land for each landowner.

3. **Application for water right.**—All water-right applications must be made to the project manager, United States Reclamation Service, Carlsbad, N. Mex., upon forms provided for that purpose, and may be made on and after the date of this notice.

4. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre to cover cost of construction of the irrigation system, termed the construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

5. **Construction charge.**—The construction charge shall be \$69 per acre of irrigable land, payable as follows: (a) For lands that were prior to August 13, 1914, subjected by contract or otherwise to the provisions of the reclamation law, said construction charge shall be paid in 10 equal annual installments, the first of which shall be paid at the time of filing water-right application, and subsequent install-

ments shall be due and payable December 1 of each year thereafter; provided, however, that if water-right application subject to the provisions of the reclamation extension act, or an acceptance of the provisions of said act, be filed within six months from the date of this notice, said construction charge shall be payable in 20 installments, the first of which shall become due and payable on December 1, 1919, and subsequent installments on December 1 of each year thereafter; in which event the first 4 installments shall each be 2 per cent, the next 2 installments each 4 per cent, and the next 14 each 6 per cent of the total construction charge.

(b) For the remaining lands an initial payment of 5 per cent of the construction charge shall be made at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual installments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual installments shall become due and payable December 1 of the fifth calendar year after the initial installment, and subsequent installments shall become due and payable on December 1 of each calendar year thereafter.

6. **Increased construction charge in certain cases.**—In all cases where water-right application for lands in private ownership or for lands under entries not subject to the reclamation law shall not be made within one year from the date of this notice, the construction charge for such land shall be increased 5 per cent each year until such application is made and an initial installment is paid.

7. **Advance payment of construction charge permissible.**—Any water-right applicant may, at his option, pay in advance the whole or any part of the construction charge owing by him within any shorter period than that prescribed by this notice.

8. **Operation and maintenance charge.**—The operation and maintenance charge shall be the same as for other like lands of the project. Such charge will be payable on March 1 of each year for the preceding irrigation season.

9. **Place and manner of payment of water charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Carlsbad, N. Mex., in cash or by New York draft or money order payable to the special fiscal agent, United States Reclamation Service.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Carlsbad project, June 30, 1919.

Cash.....		\$45. 25
Inventory of materials and supplies on hand.....		14, 692. 26
Current accounts receivable.....	\$28, 485. 82	
Construction water-right charges unaccrued.....	1, 116, 657. 70	
		1, 145, 143. 52
Gross construction cost.....	1, 383, 457. 78	
Less construction revenue earnings.....	13, 618. 90	
		1, 369, 838. 88
Net construction cost.....		25. 00
Undelivered orders.....		
Gross operation and maintenance cost.....	283, 845. 47	
Less operation and maintenance revenue earnings.....	15, 110. 96	
		270, 734. 51

258 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Accounts payable.....	\$5,583.74
Contingent obligations.....	70.25
Collections and contracts of specific amounts for repayments to reclamation fund.....	1,588,810.24
Miscellaneous accruals.....	1,437.84
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	\$1,720,306.28
Collection, transfer, refund, and joint construction vouchers issued.....	515,728.93
Net investment.....	1,204,577.35

Feature costs of Carlsbad project.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys: Preliminary surveys, etc.....		\$41,081.56
Storage systems:		
McMillan Reservoir—		
Preliminary surveys, etc.....		6,718.62
Rights of way and lands for flowage.....		105,769.09
Dam, spillways, outlet works, headworks.....	1 ¹ \$440.00	228,088.91
Avalon reservoir—Dam, spillways, outlet works.....		315,989.48
Third reservoir—Preliminary surveys, etc.....		3,146.33
Total, storage system.....	1,440.00	659,712.41
Canal system:		
Main Canal (concrete lined, 11.67 miles).....		187,828.96
East Canal.....		9,436.95
Black River cut-off canal.....		17,229.17
Black River canal.....		25,596.48
Flumes.....		21,354.99
Dark Canyon siphon.....		31,333.47
Wasteways, etc.....		29,621.20
Total, canal system.....		322,401.31
Lateral system:		
Laterals, excavation.....	37.36	32,550.7
Laterals, concrete lining.....		3,171.60
Minor structures, concrete.....	133.72	26,835.47
Minor structures, timber.....		1,457.43
Flume, near Avalon Dam.....		912.49
Siphon, near Avalon Dam.....		5,373.37
Total, lateral system.....	171.08	70,351.17
Drainage system:		
Preliminary surveys, etc.....	68.05	4,027.56
Open drains.....	2,187.71	83,885.71
Closed drains.....		44,814.56
Total, drainage system.....	2,255.76	132,727.83
Permanent improvements:		
Real estate (P. I. & I. Co. plant).....		152,057.31
Buildings.....		3,192.19
Total permanent improvements.....		155,249.50
Operation and maintenance charges transferred to and compounded with construction charges.....		1,934.00
Gross construction cost to June 30, 1919.....	1,986.84	1,383,457.78
Less revenue during construction period:		
Rentals of buildings.....	5.00	800.70
Rentals of grazing and farming lands.....	2,351.62	2,351.62
Rentals of irrigation water.....		8,163.35
Contractors' freight refunds.....	11.72	209.05
Other revenues, unclassified.....	85.00	2,692.34
Loss on hospital operations.....	1,478.10	1,598.18
Total revenues.....	1,975.24	13,618.90
Net construction cost to June 30, 1919.....	11.60	1,369,838.88

¹ Deduct.

² Actual cost for year; credit \$440 for left-over construction material transferred to operation and maintenance work.

Statement of cost by calendar years, Carlsbad project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending Dec. 31—			
1902-1905.....	\$24,713.44		\$24,713.44
1906.....	326,675.09		326,675.09
1907.....	192,504.28		192,504.28
1908.....	48,225.11	\$37,791.58	86,016.69
1909.....	16,397.25	41,963.27	58,360.52
1910.....	113,067.28	29,049.46	25,982.18
1911.....	239.30	57,398.86	57,638.16
1912.....	216,129.72	1176,279.06	139,850.66
1913.....	39,589.28	23,387.88	62,977.16
1914.....	72,434.77	18,771.56	91,206.63
1915.....	89,152.49	26,686.92	115,839.41
1916.....	102,397.85	25,549.51	127,947.36
1917.....	144,081.91	29,239.58	173,321.49
1918.....	114,409.62	40,386.47	154,796.09
Jan. 1 to June 30, 1919.....	114,425.05	29,694.46	29,269.41
Gross construction cost June 30, 1919.....	1,383,457.78	283,640.79	1,667,098.57
Plant account, June 30, 1919.....		2,204.68	2,204.68
Total.....	1,383,457.78	285,845.47	1,669,303.25

¹ Deduct.

² Actual cost for year, \$623.15. Credits explained as follows: Operation and maintenance, \$2,799.95, for December, 1909, posted in error to construction cost ledger; correction made January, 1910. Cost of project experimental farm, \$1,090.48, transferred to operation and maintenance cost ledger, January, 1910.

³ Actual cost, \$104,979.52. Actual credit of \$181,258.58 represents cost of construction work charged to operation and maintenance, and transferred to construction cost ledger after issuance of public notice of February 17, 1912.

⁴ Actual cost for first half year, \$50.75. Credits explained: Drain ditch damages to crops, \$35.80; left-over construction material transferred to operation and maintenance work, \$440.

NOTE.—Plant account balance, formerly carried under "Construction," transferred to operation and maintenance during year.

Statement of cost, by fiscal years, Carlsbad project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending June 30—			
1902-1905.....	¹ \$9,000.00		\$9,000.00
1906.....	¹ 241,000.00		241,000.00
1907.....	224,347.53		224,347.53
1908.....	103,888.41	\$9,455.24	113,343.65
1909.....	15,057.01	55,613.44	70,670.45
1910.....	11,445.67	32,578.34	44,024.01
1911.....	948.57	28,310.97	29,259.54
1912.....	201,198.67	149,756.90	151,441.77
1913.....	29,819.27	26,760.31	56,579.58
1914.....	57,094.49	23,662.81	80,757.30
1915.....	89,863.26	23,734.57	113,597.83
1916.....	81,538.97	22,283.25	103,822.22
1917.....	172,155.82	26,290.58	198,446.40
1918.....	144,113.27	35,027.67	179,140.94
1919.....	1,986.84	49,682.51	51,669.35
Gross construction cost, June 30, 1919.....	1,383,457.78	283,640.79	1,667,098.57
Plant accounts, June 30, 1919.....		2,204.68	2,204.68
Total.....	1,383,457.78	285,845.47	1,669,303.25

¹ Estimated.

² Deduct: Actual cost, \$131,501.68. Actual credit, \$181,258.58, represents construction cost charged to operation and maintenance and transferred to construction cost ledger after issuance of public notice of Feb. 17, 1912.

NOTE.—Plant account balance, formerly carried under "Construction," transferred to operation and maintenance during year.

Estimated cost of contemplated work, Carlsbad project, during fiscal year 1920.

Principal features.	Estimated cost.
Operation and maintenance under public notice.....	\$46,000
Reimbursable accounts.....	1,000
Total.....	47,000

Operating costs and revenues, Carlsbad project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage works:						
McMillan Reservoir—						
Dam, east and west embankments, spillways, and headworks.....	\$2,455.12	\$98.33	\$2,553.45	\$10,937.76	\$125.99	\$11,063.75
Right of way and lands.....		3,858.30	3,858.30		3,858.30	3,858.30
Avalon Reservoir—Dam, spillways, and headworks.....	1,319.48	178.70	1,498.18	4,568.07	843.42	5,411.49
	3,774.60	4,135.33	7,909.93	15,505.83	4,827.71	20,333.54
Canal and lateral system: Main, East, Black River cut-off, and Black River canals and structures; flumes; Dark Canyon siphon, and all laterals and structures.....	6,212.13	11,478.94	17,691.07	65,607.23	137,572.18	203,179.41
Drainage system:						
Open drains B, C, C-1, D, E, F.....		1,132.39	1,132.39		2,167.72	2,167.72
Closed drains A, D-1, G.....		68.55	68.55		944.80	944.80
		1,195.94	1,195.94		3,112.52	3,112.52
Undistributed expenses:						
Buildings and fences.....		601.79	601.79		7,707.58	7,707.58
Hydrometry.....	4,647.79		4,647.79	4,770.91		4,770.91
Roads.....					454.58	454.58
Farms.....					1,870.81	1,870.81
General expense.....	4,510.26	3,829.69	8,339.95	4,866.07	9,504.91	14,460.98
	9,158.06	4,431.48	13,589.53	9,626.98	19,627.88	29,254.86
Subtotal, operation, and maintenance.....	19,144.78	21,241.69	40,386.47	90,740.04	165,140.29	255,880.33
Less unpaid operation and maintenance charges added to construction.....						1,934.00
Total.....						258,946.33
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			54,874.49			239,684.92
Operation and maintenance charges paid in advance by water-right applicants.....			¹ 47.18			308.30
Operation and maintenance charges paid and forfeited by water-right applicants.....						151.05
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			1,550.02			3,948.97
Rentals of land and buildings during operating period.....			759.27			5,098.96
Rentals of irrigation water.....			199.47			6,255.15
Other revenues unclassified, earned during operating period.....			269.06			2,813.63
Less discounts allowed on operation and maintenance charges accrued on contracts with water-right applicants (contra).....			¹ 641.98			¹ 1,406.80
Total.....			56,933.15			256,854.20
Difference (excess).....			16,546.68			2,907.87

¹ Deduct.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT.

L. M. LAWSON, project manager, El Paso, Tex.

LOCATION.

Counties: Socorro, Sierra, Dona Ana, N. Mex.; El Paso, Tex.

Townships: 8 to 29 S., Rs. 3 E. to 5 W., New Mexico meridian.

Railroads: Atchison, Topeka & Santa Fe, El Paso & Southwestern, Southern Pacific, and Texas & Pacific.

Railroad stations and estimated population, June 30, 1919: Texas—El Paso, 75,000; Ysleta, 500; La Tuna, 325; Fabens, 500; Canutillo, 275; Clint, 500; Vinton, 25; Belen, 20. New Mexico—Las Cruces, 4,500; Mesilla Park, 850; Rincon, 400; Dona Ana, 250; Engle, 120; Bernio, 50; Fort Selden, 25; Hatch, 200; Hill, 50; Leasburg, 25; Mesquite, 50; and Vado, 50.

WATER SUPPLY.

Source of water supply: Rio Grande.

Area of drainage basin: 37,000 square miles.

Annual run-off in acre-feet of Rio Grande: At San Marcial (30,000 square miles), 1895 to 1918, inclusive, maximum, 2,422,000; minimum, 200,700; mean, 1,163,331. At El Paso, Tex. (38,600 square miles), 1889 to 1914, inclusive, maximum, 2,010,000; minimum, 50,700; mean, 925,400. Data since 1914 at El Paso are not published, as most of the surplus water since that date has been stored in Elephant Butte Reservoir.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 107,000 acres.

Area under rental contracts, season of 1919: 75,000 acres.

Length of irrigating season: From February 15 to November 15—274 days.

Average elevation of irrigable area: 3,700 feet above sea level.

Rainfall on irrigable area: 33-year average, 10.51 inches; 1918, 8.21 inches.

Range of temperature on irrigable area: -5° to 105° F.

Character of soil of irrigable area: Fertile alluvium and sandy loam.

Principal products: Alfalfa, corn, wheat, melons, fruit, and vegetables.

Principal markets: Towns in Texas, New Mexico, and Louisiana, and eastern cities.

LANDS OPENED FOR IRRIGATION.

No lands have been opened for irrigation by public notice.

All lands in the Rincon, Mesilla, and El Paso Valleys are being irrigated under rental contracts.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in March, 1903.

Construction of Leasburg unit authorized December 2, 1905.

Reclamation act extended to Texas June 12, 1906 (34 Stat., 259).

Treaty with Mexico providing for distribution of waters of the Rio Grande proclaimed January 16, 1907.

Construction of Elephant Butte Dam authorized by Congress and \$1,000,000 appropriated March 4, 1907 (34 Stat., 1357).

Leasburg unit completed July, 1908.

First irrigation by Reclamation Service (Leasburg unit), season of 1908.

Construction of Elephant Butte Dam authorized by Secretary May 23, 1910.

Construction plans of Elephant Butte Dam approved by board of engineers June 6, 1910, January 22, 1911, August 12, 1912, January 30, 1913.

Construction plans approved by Secretary October 26, 1910.

Franklin Canal purchased October, 1912.

First 11 miles of Franklin Canal reconstructed March, 1914; second section (8 miles) reconstructed 1915.

East Side Canal completed September, 1915.

West Side Canal completed November, 1915.

San Elizario feed canal completed April, 1916.

Elephant Butte Dam completed May 13, 1916.

Mesilla diversion dam completed May 31, 1916.

Leasburg extension canal and Picacho branch canal to station 121 completed May 31, 1916.

Percha Dam completed January, 1918.

Arrey Canal completed January, 1918.

Garfield flume completed February, 1911.

Garfield Canal construction begun June, 1917.

Hatch siphon construction begun January, 1918.

Hatch Canal construction begun February, 1918.

San Miguel Canal construction begun October, 1917.

Mesilla Valley, Nemexas drain begun August, 1917.

Mesilla Valley, west drain begun August, 1917.

Montoya headgate completed June, 1918.

Montoya Canal construction begun March, 1918.

Juan d'Herrera lateral district completed May, 1918.

San Elizario headgate completed May, 1918.

San Elizario main canal construction begun January, 1918.

El Paso Valley River and middle drains construction begun July, 1917.

Rincon Siphon begun August, 1918.

Hatch Siphon completed October, 1918.

Construction Rincon main canal begun October, 1918.

Hatch Canal completed March, 1919.

Community canals, Mesilla Valley, deeded to the service for reconstruction and operation, December, 1918.

Rincon siphon completed March, 1919.

Feeder canal for San Elizario Island completed March, 1919.

Project, exclusive of Elephant Butte Dam, 53 per cent completed June 30, 1919.

Project, including Elephant Butte Dam, 70.7 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Rio Grande project provides for the storage of flood waters of the Rio Grande in a reservoir controlled by Elephant Butte Dam, about 12 miles west of Engle, N. Mex., and the diversion of water from the Rio Grande, about 24 miles below for watering lands in Rincon Valley; about 60 miles below for the irrigation of 35,000 acres in the upper Mesilla Valley under the Leasburg diversion dam; about 80 miles below for the irrigation of 47,000 acres in the lower Mesilla Valley under the Mesilla Dam; and about 120 miles below for supplying water to lands in El Paso Valley and furnishing 60,000 acre-feet per annum for use on land in El Paso Valley on the Mexican side of the Rio Grande. The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith. All irrigation works required for Las Palomas and Rincon Valleys will be new; those for the Mesilla Valley include a diversion and 10.8 miles of canal now constructed, as well as a diversion dam $5\frac{1}{2}$ miles southwest of Las Cruces and 27 miles of canal leading therefrom which have also been constructed; and those required for El Paso Valley will supplement and improve present canal systems.

The features of the above irrigation plan that have been completed are the Elephant Butte Dam, the Percha diversion dam, the Arrey Canal, the Garfield flume, the Garfield main canal, the Hatch siphon, Hatch main canal, the Rincon siphon, the Leasburg diversion dam and Leasburg main canal, extension of the Mesilla diversion dam and east and west side canals in the lower Mesilla Valley, the Montoya temporary intake works and main canal in the lower east side of the Mesilla Valley (but in the Texas irrigation district) the reconstruction of practically all the Franklin Canal, the construction of the San Elizario main canal headworks, the reconstruction of the main canal, and the construction of the San Elizario Island feeder canal and flume across the Rio Grande in the El Paso Valley. The construction of 10 main drains is also under way.

SUMMARY OF GENERAL DATA FOR RIO GRANDE PROJECT TO END OF FISCAL YEAR 1919.

Areas:	
Irrigable acreage when project is complete.....	162,000
Public land entered to June 30, 1919.....	553
Public land withdrawn on June 30, 1919.....	4,890
State land, unsold, June 30, 1919.....	2,602
Railroad land, June 30, 1919.....	360
Private land, June 30, 1919.....	153,595
Acreage service could have supplied in season of 1918.....	92,300
Estimated acreage service can supply in season 1919.....	107,000
Estimated acreage service can supply in season 1920.....	110,000
Acreage irrigated, season of 1918.....	64,781
Acreage cropped under irrigation season of 1918.....	64,002
<hr/>	
Crops:	
Value of irrigated crops, season of 1918.....	\$4,237,020.00
Value of irrigated crops per acre cropped.....	\$66.20
<hr/>	
Finances:	
Net construction cost to June 30, 1919.....	\$9,100,667.89
Per cent completed on June 30, 1919.....	70.7
Appropriated for fiscal year 1920.....	\$1,250,000.00
Estimated per cent complete by June 30, 1920.....	79.4
Proposed appropriation for fiscal year 1921.....	\$1,000,000.00
Estimated per cent complete by June 30, 1921.....	87.5
Unexpended balance 1918 appropriation.....	\$145,174.05
Increased compensation.....	65,622.90
Appropriation fiscal year 1919.....	1,296,000.00
Increase, miscellaneous collections.....	206,177.54
	<hr/>
	\$1,712,974.49
Expenditures chargeable to 1919 appropriation:	
Disbursements—	
Reclamation fund.....	1,205,444.44
Increased compensation.....	65,622.90
Transfers.....	116,848.46
Current liabilities, 1919.....	158,972.85
Contingent liabilities, 1919.....	28,891.00
	<hr/>
	1,575,779.65
Balance on July 1, 1919.....	<hr/>
	137,194.84
<hr/>	
Repayments:	
Water-rental charges—	
Accrued to June 30, 1919.....	644,016.27
Collected to June 30, 1919.....	559,285.30
	<hr/>
Uncollected on June 30, 1919.....	84,730.97
<hr/>	
Drainage—	
Estimated acreage damaged by seepage to June 30, 1919.....	80,700
Miles of open drains built to June 30, 1919.....	119.1
Estimated acreage protected by drains to June 30, 1919.....	57,000
Estimated acreage to be protected by authorized system.....	147,000
Cost of drainage works to June 30, 1919.....	\$930,535.95

CONSTRUCTION DURING FISCAL YEAR.

Hatch siphon.—This structure, upon which construction was begun in January, 1918, was completed in October, 1918, and placed in commission at the beginning of the irrigation season of 1919.

Hatch Canal.—A portion of this reconstruction work, which was begun previous to the 1918 irrigation season, was practically completed during the 1918-19 winter months, when opportunity for work was present with water out of the canals.

Canal and lateral systems.—In December, 1918, the following community canals were deeded to the Reclamation Service for reconstruction and operation: The Las Cruces, Mesilla, and Dona Ana community canals in the Las Cruces district; the La Mesa and Chamberino in the west side of the Mesilla Valley; and the Three Saints community canal in the east side of the Mesilla Valley. Over 100 miles of community ditch were taken over by this transfer, and a large amount of reconstruction work accomplished previous to the beginning of the 1919 irrigation season. Practically all community canals in the Mesilla Valley have been now deeded to the Reclamation Service, the only exception being the La Union Irrigation Co. system, which irrigates approximately 10,000 acres in the lower west side of the Mesilla Valley. It is contemplated that during the coming winter season this property will also be transferred to the Government for reconstruction and operation. In the El Paso Valley some extensions were made to the canal and lateral system during the winter season, which included construction by contract work in the Ysla, Island, and other lateral districts, and the completion of the Island feeder canal system.

Drainage construction.—At the end of the fiscal year 119 miles of open drain had been constructed on the project, all of which except 4 miles were built by Government forces. The excavation involved by machine was 5,573,700 cubic yards. Ten main drains were being excavated at the close of the year. On June 30, 1919, drainage construction was 36 per cent completed.

Surveys.—Surveys during the fiscal year included the extension of lateral systems in the Mesilla and El Paso Valleys and investigations, accompanied by surveys, for the Tornillo and Fort Hancock districts in the lower end of the project. Extensive drainage surveys have been made covering the Rincon Valley, in addition to those required for the Mesilla and El Paso Valleys.

SEEPAGE AND DRAINAGE.

Investigations of ground-water conditions in the Rincon, Mesilla, and El Paso Valleys were continued and extended during the year. The well readings so acquired and taken at regular intervals were utilized for the location of the large mileage of contemplated drainage canals. The serious seepage condition present during the previous fiscal year has been relieved to a large extent by the construction of drains. The area so protected by drainage ditches on June 30, 1919, is estimated at 57,000 acres.

During the fiscal year additions to the drainage equipment already assembled consisted of six drag line excavators, four of which were of the Bucyrus 1½-yard type similar to the four received during the previous fiscal year; one Monighan 2-T machine was also received and placed on excavation in the Leasburg district. Mechanical defects in the new machines, which had prevented the expected output, were corrected in all machines during the year. In addition to the Government equipment, contract with the Jennings Construction Co., of El Paso, was made for the excavation of approximately 10 miles of drainage canal in the vicinity of Las Cruces, and work was begun on this feature in August, 1918.

IRRIGATION DISTRICTS.

Following the formation of the two irrigation districts necessary in the New Mexico and Texas portions of the project, completed during the fiscal year 1919, contracts were executed between the Secretary of the Interior and the district authorities for the completion of drainage and lateral work. In the New Mexico portion of the project this contract involves the expenditure of \$6,530,000. In the Texas portion of the project the expected expenditure under contract for drainage and lateral system involves \$4,260,000. The property owners in the Tornillo district of 4,600 irrigable acres, located below Fabens, Tex., formed an irrigation district under Texas State laws during the early part of 1919. Contract with the service was being negotiated at the end of the fiscal year.

ECONOMIES OF GOVERNMENT WORK.

On account of the high cost of forage and labor unit prices for excavation by contract teamwork averaged during the fiscal year 26 cents per cubic yard. Further advertising for team excavation resulted in higher bids, which were not awarded. The Chamberino east lateral, about 6½ miles long, involving 64,300 cubic yards of earthwork, was then excavated by Government forces, using a Bucyrus excavator at a unit cost of 9.2 cents per cubic yard.

In order to expedite drainage work, advertisements were circulated for the construction by contract of a section of drain in the Mesilla Valley, and bids ranging from 10½ cents to 16 cents were obtained. Award was made to the lowest bidder at 10½ cents. To date the excavation by Government forces of approximately a million and a half cubic yards on similar work has been accomplished at a cost of 8.4 cents per cubic yard.

OPERATION AND MAINTENANCE.

The Reclamation Service delivered water in 1918 on a rental basis to 64,781 acres; the larger acreage of this amount was in New Mexico, and water was supplied under contract with the Elephant Butte Water Users' Association at the rate of actual cost of operation and maintenance plus 10 per cent. In addition a charge of 50 cents was made for reservoir service.

The transfer of community ditch properties in December, 1918, was followed by the negotiation and acceptance of individual contracts directly with the service in the New Mexico portion of the project. In the El Paso Valley in Texas water was supplied under contract with individuals, as in the previous irrigation season. The uniform individual water-rental contract rate was inaugurated throughout the project, with charges for water at the rate of 75 cents per acre-foot for the first 3 acre-feet, \$1 per acre-foot for the fourth acre-foot, and \$1.25 per acre-foot for any water used in excess of 4 acre-feet. In addition a charge of 50 cents per acre was made for reservoir service.

The total amount of water diverted throughout the project amounted to 348,296 acre-feet, giving a duty of approximately 5.37 acre-feet per acre. This amount is measured at the point of delivery from canals. The taking over of community ditches in the El Paso

Valley reduced the water use and eliminated much waste in irrigation. The same result is expected by the transfer of community ditches to a centralized control in the Mesilla Valley.

Individual measurements were carried on as far as possible, and beginning with the season of 1919 an extension of the organization and facilities for obtaining the correct amount of individual use were accomplished. This service includes a monthly statement to irrigators of the amount of water furnished in acre-feet during the month: On June 30, 1919, the service was prepared to supply water to 107,000 acres.

Historical review, Rio Grande project.

Item.	1913	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	35,000	40,000	45,000	85,000	88,000	92,300	107,000
Acreage irrigated.....	27,723	28,442	33,876	62,513	64,308	64,781	75,000
Miles canal operated.....	37	37	37	75	86	153	291
Water diverted (acre-feet).....	\$ 149,610	\$ 179,964	\$ 199,952	\$ 420,646	\$ 622,177	\$ 613,638	\$ 385,000
Water diverted to land (acre-feet).....						\$ 348,296	225,000
Per acre of land irrigated (acre-feet).....	4.34	5.68	5.90	6.73	8.0	5.37	3.0

¹ Estimated.

² Measured at point of delivery from canals.

³ Total diversions, including water wasted and rediverted from river below.

⁴ Total diversions less water wasted and re-diverted.

⁵ Includes delivery to farms by U. S. Reclamation Service operation and to heads of community ditches.

SETTLEMENT.

The results of drainage work accomplished were of such satisfactory extent as to give encouragement to settlement, particularly in the Mesilla Valley. A large number of land sales and transfers were effected, and although no attempt was made to interest outside settlers in the settlement of lands, because of their condition, quite a number of newcomers, who had previously been interested in project development, made purchases of tracts where protected by drains. A very small area of new land was placed in cultivation, since construction results were more in the nature of perfecting the water supply for the present area than in the addition of new tracts.

Considerable activity was present in clearing lands and growing crops in the newly formed Tornillo irrigation district, below the town of Fabens. No construction work has been possible in this area, but water is delivered in the river opposite various community canals for its diversion to this territory.

Settlement data, Rio Grande project.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms.....	1,536	1,700	1,638	1,700	2,287	2,703
Population.....	6,642	10,000	10,431	10,500	10,259	12,890
Number of irrigated farms.....	1,536	1,700	1,638	1,700	2,287	2,703
Operated by owner.....	932	1,000	1,145	1,170	1,377	1,966
Operated by tenants.....	604	700	493	530	910	737
Number of towns.....	25	25	25	25	27	27
Population.....	78,135	80,000	86,331	86,600	87,997	89,316
Total population in towns and on farms.....	84,777	90,000	96,762	97,100	98,256	102,206
Number of public schools.....	47	52	52	52	52	54
Number of churches.....	81	85	87	90	99	101
Number of banks.....	14	18	18	18	18	17
Amount of capital stock.....	\$2,645,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,250,000
Amount of deposits.....	\$11,6530.00	\$19,916,380	\$29,282,455	\$31,000,000	\$32,000,000	\$33,000,000
Number of depositors.....	40,000	40,000	40,000	40,000	40,000	44,000

PRINCIPAL CROPS.

The principal crops raised on the project during the year 1918 were, as in former years, alfalfa, wheat, and corn. A slight increase in the average yield of alfalfa is noticeable in comparison with the yield of 1917. The yield, however, as compared with previous years, before seepage conditions were so serious, is still susceptible of increase. The first portion of the fiscal year the season was very favorable for fruit, especially pears. The increase in crop value, due to war demands, resulted in increasing the average yield value per acre cropped from \$56.50 for 1917 to \$66.20.

Crop report, Rio Grande project, New Mexico-Texas, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	28,867	Ton.....	79,568	2.8	\$25.94	\$2,064,347	\$71.51
Alfalfa seed.....	83	Bushel.....	172	2.1	12.03	2,070	24.94
Apples.....	95	Pound.....	238,063	2,506	.02	5,450	57.37
Barley.....	428	Bushel.....	9,910	23	2.00	19,820	46.31
Beans.....	2,648	do.....	23,984	9.1	4.50	108,521	40.98
Beets, sugar.....	5	Ton.....	35	7	5.00	175	35.00
Cane.....	3,735	do.....	18,062	4.8	15.00	270,932	72.54
Cantaloupes.....	57	Crate.....	22,800	400	.60	13,680	240.00
Corn, Indian.....	10,175	Bushel.....	239,915	24	1.87	448,747	44.10
Corn, sorghum ¹	660	Ton.....	4,620	7	6.00	27,720	42.00
Do. ²	296	Bushel.....	1,717	5.8	3.34	5,736	19.38
Corn fodder.....	583	Ton.....	1,512	2.6	12.43	18,790	32.23
Cotton.....	608	Pound.....	148,000	243	.25	37,000	60.86
Truck, small.....	35	do.....	90,090	2,574	.10	9,009	257.40
Gardens.....	657					66,842	101.74
Hay, miscellaneous.....	387	Ton.....	1,344	3.5	19.77	26,579	68.68
Millet seed.....	1	Bushel.....	20	20	1.25	25	25.00
Milo maize.....	80	do.....	2,800	35	2.00	5,600	70.00
Oats.....	697	do.....	32,720	47	.78	25,596	36.72
Pasture.....	1,932					27,883	14.43
Onions.....	1	Bushel.....	35	35	1.71	60	60.00
Peaches.....	99	Pound.....	214,320	2,165	.04	9,189	92.82
Pears.....	476	do.....	3,991,115	8,385	.03	125,340	263.32
Peas.....	10	Bushel.....	109	10	6.00	600	60.00
Potatoes, sweet.....	177	do.....	17,578	99	1.01	17,731	100.18
Potatoes, white.....	7	do.....	2,000	29	.52	1,032	147.60
Rye.....	85	do.....	1,360	16	2.00	2,720	32.00
Tomatoes.....	204	Pound.....	1,070,000	5,245	.01125	12,135	59.41
Watermelons.....	85					3,077	36.20
Wheat.....	11,651	Bushel.....	385,369	33	2.15	829,174	71.17
Miscellaneous.....	1,286					51,440	40.00
Less duplicated areas.....	2,108						
Total cropped acreage.....	64,002	Total and average.....				4,237,020	66.20
Irrigated, no crop:		Areas.				Acres.	Farms.
Young alfalfa.....	25						
Nonbearing orchards.....	434						
Pasture (not reported).....	300						
Crops without yield (not reported).....	20						
Total irrigated acreage.....	64,781	Total irrigable area farms reported.....				71,564	2,287
		Total irrigated farms reported.....				64,781	2,287
		Under rental contracts.....				64,781	2,287
		Total cropped area farms reported.....				64,781	2,287

¹ Seed and cane used.

² Seed only used.

NOTE.—In the above crop list there is included the following acreage of crops without yield: Alfalfa, 17.5 acres; corn, Indian, 22 acres; wheat, 39 acres; beans, 30.25 acres.

FINANCIAL STATEMENT.

Condensed balance sheet, Rio Grande project, June 30, 1919.

Cash.....	\$17,380.77
Inventory of materials and supplies.....	269,722.84
Accounts receivable.....	85,680.42
Construction work contracted.....	77,471.89
Gross construction cost.....	\$9,775,296.36
Less construction revenue earnings.....	674,628.47
Net construction cost.....	9,100,667.89
Accounts payable.....	180,070.40
Contingent obligations.....	94,832.86
Collections and contracts of specific amounts for repayments to reclamation fund.....	36.00
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	\$10,306,711.35
Collection, transfer, refund, and joint construction vouchers issued.....	1,100,746.60
Net investment.....	9,296,964.75

Feature costs, Rio Grande project.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Project, general.....	\$5,811.24	\$82,430.40
High-line canal.....		37,513.76
Silt deposits, Elephant Butte Reservoir.....	194.36	9,430.48
Hydrographic survey, New Mexico.....		5,534.43
Hydrographic survey, Colorado.....		15,409.70
Drainage investigation, San Luis Valley.....		7,286.53
San Marcial investigations, New Mexico.....		1,792.34
Topographic surveys, Tornillo and Fort Hancock districts.....	11,951.04	14,857.73
Rio Grande hydrometry.....	1,560.45	2,847.76
Subtotal.....	19,507.09	177,103.13
Storage system, Elephant Butte Reservoir:		
Preliminary and general.....		398,350.48
Elephant Butte Dam (see sheet).....	42,914.17	4,214,880.92
Embankment.....		129,946.04
Spillway.....		124,461.35
Subtotal.....	42,914.17	4,867,638.79
Canal system:		
Palomas system, preliminary.....	¹ 1,774.73	
Rincon system.....	193,840.78	828,856.45
Leasburg system.....	² 3,698.94	285,327.96
Mesilla system.....	¹ 16,428.92	528,231.58
El Paso Valley system.....	103,011.22	634,279.21
Subtotal.....	282,347.29	2,276,695.20
Lateral system:		
Leasburg system.....	112,535.78	116,495.56
Rincon system.....	36,392.98	39,327.47
Mesilla system.....	98,001.82	107,365.51
El Paso Valley system.....	156,672.53	326,665.57
Subtotal.....	403,603.11	589,854.10
Drainage system:		
Project as a whole, preliminary.....	¹ 164.51	
Palomas system, preliminary.....	¹ 20.41	
Rincon system.....	1,471.97	4,904.16
Mesilla Valley system—		
Preliminary surveys and testing.....	9,432.96	34,967.32
East drain.....	¹ 1,180.15	89,633.56
Nemexas drain.....	37,272.01	77,698.32
West drain.....	66,682.95	107,654.34

¹ Deduct.² Credit on Palomas system, principal feature No. 4, in April, 1919, due to transfer to principal feature No. 1.³ Credit of \$7,563.34 on Leasburg Canal extension, in February, 1919, due to transfer of charges to principal feature No. 5. Actual cost for the year, \$11,262.28.⁴ Credit of \$22,456.04 on San Miguel Branch of West Side Canal, in November, 1918, due to transfer of charges to principal feature No. 5. Actual cost during the year, \$6,027.12.⁵ Credit of \$164.51 on preliminary surveys, drainage, project as a whole in April, 1919, due to transfer to principal feature No. 1.⁶ Credit of \$21.41, drainage, Palomas system, preliminary in April, 1919, due to transfer to principal feature No. 1.⁷ Credit of \$1,190.31 on excavation and minor structures, east drain. Actual cost during year, \$10.16.

Feature costs, Rio Grande project—Continued.

Features.	Fiscal year 1919	Total to June 1919.
Drainage system—Continued.		
Mesilla Valley system—Continued.		
Lower Leasburg drain	\$29,973.01	\$30,069.42
Anthony drain	27,458.95	28,904.27
La Mesa drain	43,434.46	43,482.07
Chamberino drain	14,579.72	14,608.61
Vinton drain	21,226.18	21,252.57
Park drain	17,442.24	17,469.86
Upper Leasburg drain	6,084.14	6,084.14
Central drain	17,634.62	17,634.62
Del Rio drain, right of way	8.66	8.66
El Paso Valley system—		
Surveys and testing, undistributed	10,392.32	35,117.97
Mesa drain	83,103.37	181,933.29
Middle drain	53,639.83	94,090.50
Franklin drain (formerly called Fabens drain)	62,662.79	62,720.58
Clint spur drain	7,990.12	7,990.12
Island drain	33,596.45	33,596.45
River drain	360.44	18,123.92
Montoya surveys	27.09	1,328.89
Tornillo district surveys	1,307.31	1,307.31
Subtotal	544,416.52	930,535.96
Flood protection:		
Project as a whole, preliminary	^{1,2} 3,749.84	
Palomas Valley system	^{1,3} 33.43	
Rincon Valley system	479.57	479.57
Leasburg system, cut-off in river channel	903.02	14,780.61
Mesilla Valley system	1,127.50	6,588.70
El Paso Valley system	1,163.22	2,026.48
Montoya district, surveys and testing	76.53	76.53
Subtotal	133.43	24,861.80
Power system: Transmission lines	^{1,4} 1,294.14	
Subtotal	1,294.14	
Farm units:		
Subdivision surveys, project as a whole	^{1,5} 244.40	2,005.83
Palomas Valley system	^{1,6} 3,352.33	
Rincon Valley system	287.79	21,142.81
Leasburg Valley system	541.89	15,072.39
Mesilla Valley system	676.60	53,081.81
El Paso Valley system	^{1,7} 1,108.97	26,853.04
Montoya Valley system	1,852.92	1,852.92
Tornillo district	2,657.88	2,657.88
Subtotal	1,311.38	122,666.68
Permanent improvements:		
Leasburg system—		
Buildings		3,053.02
Roads	^{1,14} 319.73	10,375.60
Mesilla Valley system—		
Buildings	185.00	1,543.90
Roads	^{1,8} 1,511.42	
El Paso system—Buildings		1,381.26
Rincon Valley system—Buildings	⁹ 210.28	3,236.83
Montoya District—		
Buildings	847.62	847.62
Roads, Elephant Butte Dam		26,612.37
Subtotal	1588.25	47,050.60

¹ Deduct.² Credit of \$3,749.84 on flood protection, in April, 1919, project as a whole, due to proration of these charges to the different valleys.³ Credit of \$33.43 on Palomas Valley system, in April, 1919, due to transfer of charges to principal feature No. 1.⁴ Credit on \$1,294.14 on power system, in April, 1919, due to transfer of charges to principal feature No. 2.⁵ Credit of \$244.40 on farm units, project as a whole, due to credit of \$2,250.23, in April, 1919; the latter amount was prorated to the various valleys.⁶ Credit of \$3,352.33 on farm units, Palomas Valley system, in April, 1919, due to transfer of charges to principal feature No. 1.⁷ Credit of \$1,108.97 on flood protection, El Paso Valley system, due to credit of \$1,807 in March, 1919, this amount being transferred to Montoya district at that time.⁸ Credits due to transfer to canal system.⁹ Credit of \$91.97 on permanent improvements, Rincon Valley, buildings, due to transfer to principal feature No. 12. Actual cost during year, \$302.25.

Feature costs, Rio Grande project—Continued.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Telephone system:		
Leasburg system.....		\$1,400.52
Mesilla system.....		8,761.24
Rincon system.....		7.57
Subtotal.....		10,169.33
Subtotal.....	\$1,292,183.74	9,046,575.67
Operation and maintenance during construction (water-rental basis).....	169,675.60	507,300.23
Total cost of construction features.....	1,461,859.34	9,553,875.90
Balance in plant accounts:		
El Paso.....		337,148.87
Elephant Butte.....		120,779.68
		216,369.19
Clearing accounts (unadjusted).....		5,051.27
Gross construction cost to June 30, 1919.....	1,461,859.34	9,775,296.36
Less revenues earned during construction period:		
Rental of buildings.....	1,211.59	13,898.55
Rental of grazing and farming lands.....	100.22	108.22
Net power earnings (prior to public notice).....		2,243.33
Rental of irrigation water.....	223,312.64	644,016.27
Contractor's freight refunds (shown in error in Seventeenth Annual Report as rental of telephone and tolls).....	556.77	5,883.64
Other revenues, unclassified.....	189.86	877.46
Other operations, unclassified.....	39,834.16	
Suspended contract cost, Knowles & Warren contract No. 777.....	4,940.12	
Profit on hospital operations.....	2,672.41	7,601.00
Total.....	263,077.53	674,628.47
Net cost of project.....	1,198,781.81	9,100,667.89

¹ Deduct.*Statement of cost by calendar years, Rio Grande project.*

	Construction.	Operation and maintenance during construction.	Total.
Year ending Dec. 31—			
1906.....	\$24,589.24		\$24,589.24
1907.....	141,484.18	\$2,398.86	143,883.04
1908.....	153,567.87	2,400.51	155,968.38
1909.....	105,421.86	1,890.88	107,312.74
1910.....	334,599.30	4,435.18	339,034.48
1911.....	585,991.02	5,303.18	591,294.20
1912.....	859,515.72	5,587.05	865,102.77
1913.....	942,232.25	23,864.19	966,096.44
1914.....	2,009,399.24	30,738.25	2,130,135.49
1915.....	901,476.03	47,770.61	949,246.64
1916.....	520,271.63	58,346.46	578,617.99
1917.....	476,912.70	78,764.78	555,677.48
1918.....	1,054,710.90	124,295.63	1,179,006.53
To June 30, 1919.....	846,403.83	121,506.65	967,910.48
Subtotal.....	9,046,575.67	507,300.23	9,553,875.90
Plant accounts to June 30, 1919.....	216,369.19		216,369.19
Clearing accounts to June 30, 1919.....	5,051.27		5,051.27
Total.....	9,267,996.13	507,300.23	9,775,296.36

Statement of cost by fiscal years, Rio Grande project.

	Construction.	Operation and maintenance during construction.	Total.
Year ending June 30—			
1907.....	\$89,757.29		\$89,757.29
1908.....	174,949.01	\$2,138.18	177,087.19
1909.....	113,335.41	1,167.54	114,502.95
1910.....	259,654.15	6,856.40	266,510.55
1911.....	503,292.41	5,690.44	308,972.85
1912.....	777,317.32	5,678.88	782,996.20
1913.....	947,304.36	7,447.45	954,751.81
1914.....	1,451,013.42	33,490.27	1,484,503.69
1915.....	1,500,688.47	47,277.71	1,547,966.18
1916.....	940,642.06	41,396.66	982,038.72
1917.....	382,841.93	68,586.76	451,428.69
1918.....	813,596.10	117,904.34	931,500.44
1919.....	1,292,183.74	169,675.60	1,461,859.34
Subtotal.....	9,046,575.67	507,300.23	9,553,875.90
Plant accounts to June 30, 1919.....	216,369.19		216,369.19
Clearing accounts to June 30, 1919.....	5,051.27		5,051.27
Total.....	9,267,996.13	507,300.23	9,775,296.36

Estimated cost of contemplated work, Rio Grande project, during fiscal year 1920.

Principal features.	Subfeature.	Principal feature.
Examination and surveys:		
Elephant Butte silt surveys.....	\$3,000	
Miscellaneous.....	1,000	
		\$4,000
Storage: Elephant Butte balanced valves.....		4,000
Canal system:		
Rincon Valley, Hatch Canal.....	2,000	
El Paso Valley, Mexican Dam sluiceway.....	14,000	
		16,000
Lateral system:		
Rincon Valley.....	3,000	
Mesilla Valley.....	85,000	
El Paso Valley.....	130,000	
		219,000
Drainage system:		
Mesilla Valley.....	350,000	
El Paso Valley.....	175,000	
		525,000
Irrigable lands, farm units.....		10,000
Permanent improvements and lands.....		1,500
Operation and maintenance during construction (water rental basis).....		220,500
Total.....		1,000,000

NORTH DAKOTA, NORTH DAKOTA PUMPING PROJECT.

W. S. ARTHUR, project manager, Williston, N. Dak.

LOCATION.

County: Williams.

Townships: 152 to 155 N., Rs. 100 to 104 W., fifth principal meridian.

Railroad: Great Northern.

Railroad stations and estimated population June 30, 1919: Buford, 75; Trenton, 150; and Marley (less than 25), on Buford-Trenton unit are small unincorporated villages. Williston, on the Williston unit, is an incorporated city of about 5,300 population.

WATER SUPPLY.

Source of water supply: Missouri River.

Area of drainage basin: 155,000 square miles.

Mean run-off of Missouri River, near Williston, May to October, 1905 to 1907: 15,000,000 acre-feet.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season 1919: Buford-Trenton unit, 4,049 acres; Williston unit, 8,189 acres.

No part of the project was irrigated in 1918. The Williston unit is being operated for commercial power, under a contract with the city of Williston. Irrigation was resumed June 1, 1919, under a contract with the Williston irrigation district.

Length of irrigation season: 80 days, beginning from June 1 to June 15.

Average elevation of the irrigable area: 1,900 feet above sea level.

Rainfall: The actual precipitation, calendar year 1918, was 13.84 inches. The average for 15 years, beginning in 1904, is 13.50 inches. In 1918, 50 per cent of the precipitation came after the growing season.

Range of temperature on the irrigable area: -49° to 107° F.

Character of soil on irrigable area: Ranges from sandy loam to heavy clay gumbo.

Principal products: Alfalfa, grains, vegetables. The production of corn for silage is increasing as well as the output of hogs, and dairying has become well established.

Principal markets: St. Paul, Minneapolis, Duluth, Chicago. The local market is now important since it consumes all of the butter product and all of the output from the dairies.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: Buford-Trenton unit, April 8, 1908; March 9, May 13, 1911; June 25, 1912; July 15, 1913; February 26, March 7, 1914. Williston unit, April 27, November 30, 1908; April 30, 1909; March 9, April 14, 1911; June 25, 1912; March 11, June 23, July 15, July 21, 1913; February 26, March 7, 1914.

Location of lands opened: Buford-Trenton unit, Tps. 152 and 153 N., Rs. 103 and 104 W., fifth principal meridian; Williston unit, Tps. 154 and 155, N., Rs. 100 and 101 W., fifth principal meridian.

Limit of area of farm units: Public, 80 acres; private, 160 acres.

Duty of water: Two acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land: \$38 under public notice of 1908.

Annual operation and maintenance charge: 70 cents per acre of irrigable land and 50 cents per acre-foot of water actually used, under public notices of 1908; \$1.50 per acre of irrigable land and \$1 per acre-foot of water used under order of May 13, 1911. For season of 1914 the project was on a rental basis and the terms were \$1 per acre, including 1 acre-foot of water, and \$1 per acre-foot for water delivered in excess of 1 acre-foot per acre. For the season of 1919 the irrigation district fixed the operation and maintenance charge at \$1 per acre, which includes 1 acre-foot of water, and \$2 per acre-foot for water delivered in excess of 1 acre-foot per acre.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1903.

Construction recommended by board of engineers September 22, 1905.

Construction authorized by Secretary January 23, 1906.

First division: Buford-Trenton unit completed November, 1907.

Power and pumping plants: Williston unit, completed for present use in the fall of 1907; first division completed in the spring of 1908.

Pumping plant and transmission lines: Buford-Trenton unit, completed for present use in the spring of 1908.

First irrigation by Reclamation Service, season of 1908:

Power installation completed for 2,000 horsepower June 30, 1910.

Buford-Trenton unit, 33 per cent completed June 30, 1918; Williston unit, 64 per cent completed June 30, 1918.

Entire project, 64 per cent completed June 30, 1918.

IRRIGATION PLAN.

The irrigation plan of the North Dakota pumping project provides for a central team-power plant located near Williston, operating pumps and generating electricity for the operation of other pumps on the Buford-Trenton and Williston units. On the Buford-Trenton unit water is pumped from a barge into a settling basin 30 feet above the river, and is then lifted by a permanent pumping station into a canal, 50 feet above the settling basin, for the irrigation of bench lands near Buford. A transmission line 28.3 miles in length delivers power for the operation of the pumps. The plan of the Williston unit provides for a series of motor-driven centrifugal pumps on a barge in the Missouri River, a settling basin receiving the water from the barge, and a main canal of 90 second-feet capacity extending along Little Muddy Creek to the power plant, where two sets of steam-driven turbines operate centrifugal pumps to lift water 51 feet into E Canal. From the main canal, about midway between the river and the power plant electrically driven pumps raise 35 second-feet 28 feet into B Canal, and from the B Canal 20 second-feet are raised an additional 28 feet into C Canal. The main power station is located close to a 9-foot vein of lignite coal, from which fuel is obtained.

The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

The features of the above irrigation plan which have been completed are: The central power station, coal mine and transmission lines; at Buford-Trenton unit, two pumping stations, settling basin, and canal system; at Williston unit, four pumping stations, two settling basins, and canal system. No construction work is in progress at present.

Features remaining for future construction are: The enlargement of the power house and installation of additional machinery; at Buford-Trenton unit, extension of High-line Canal and construction of Lowline Canal and laterals for irrigation of bottom lands; at Williston unit, construction of east and west bottom canal systems, with additional intake and pumping stations.

SUMMARY OF GENERAL DATA FOR NORTH DAKOTA PUMPING PROJECT TO END OF FISCAL YEAR 1919.**Areas:**

Irrigable acreage when project is complete	26, 151
Public land entered to June 30, 1919	259
Public land open to entry on June 30, 1919	532
State land June 30, 1919	1, 073
Private land June 30, 1919	24, 287
Acreage service could have supplied in season of 1918	12, 238
Estimated acreage service can supply in season of 1919	12, 238
Estimated acreage service can supply in season of 1920	12, 238
Acreage dry farmed season of 1918 (estimated)	3, 000

Crops:

Value of dry-farmed crops season of 1918	\$12, 000
Value of dry-farmed crops per acre cropped	\$4

Finances:

Net construction cost to June 30, 1919	\$711, 690. 96
Per cent completed on June 30, 1919	64
Appropriated for fiscal year 1920	\$85, 000. 00
Estimated per cent complete by June 30, 1920	64

Finance—Continued.

Proposed appropriation fiscal year 1921.....	\$119,000
Estimated per cent complete by June 30, 1921.....	64
Announced construction charges per acre.....	<u>\$38.00</u>
Appropriation fiscal year 1919.....	\$64,000.00
Increased compensation.....	2,556.49
Increase miscellaneous collections.....	61,149.65
	<u>\$127,706.14</u>
Expenditures chargeable to 1919 appropriation:	
Disbursements.....	\$63,124.40
Transfers.....	5,092.01
Current liabilities.....	<u>10,110.13</u>
Contingent liabilities.....	78,326.54
Unencumbered balance on July 1, 1919.....	<u>49,379.60</u>
Repayments:	
Value of construction water-right contracts.....	<u>290,803.74</u>
Construction charges—	
Accrued to June 30, 1919.....	8,863.18
Collected to June 30, 1919.....	<u>8,863.18</u>
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	24,278.91
Collected to June 30, 1919.....	<u>12,964.28</u>
Uncollected on June 30, 1919.....	<u>11,314.63</u>
Water-rental charges—	
Accrued to June 30, 1919.....	2,948.58
Collected to June 30, 1919.....	<u>2,149.03</u>
Uncollected on June 30, 1919.....	<u>799.55</u>
Power charges—	
Accrued to June 30, 1919.....	173,931.51
Collected to June 30, 1919.....	<u>170,958.46</u>
Uncollected on June 30, 1919.....	<u>2,973.05</u>
Drainage: Miles of open drains built to June 30, 1919.....	12.7
Cost of drainage works to June 30, 1919.....	<u>\$3,546.95</u>

ECONOMIES OF GOVERNMENT WORK.

Coal mine.—During the fiscal year 1919 all coal was taken from blocks 1 and 2 north and blocks 1 and 2 south in the new east workings; 2,000 feet of entries were driven in blocking out coal bodies for the irrigation season 1919. Two thousand five hundred feet of new track were laid, an inside parting was built in the mine to divide the haulage work during the irrigation season, electric lights were installed to the inside parting, the airways and entries were permanently timbered, and a mine telephone was installed. These are in the nature of development, but the costs were placed against the cost of coal which was \$20,880 for 10,703 tons mined or \$1.95 per ton.

Since \$4,000 of the cost was development work, the cost for coal produced, including the maintenance of workings, was \$16,880 or \$1.57½.

Coal for power plant was sold in the community for \$2.50 per ton and for domestic purposes for \$3.50 per ton. The coal mining operations therefore show a saving of 92½ cents per ton over coal sold for similar service or \$1.92½ over coal sold for domestic purposes.

The schedule of wages paid in the coal mine was 40 to 60 per cent higher than during the preceding year.

COMMERCIAL POWER.

The contract with the city of Williston, dated October 16, 1912, covering the delivery of surplus electrical energy from the power plant, remained in force, and the plant was in operation the entire year to furnish power under this contract. An agreement in amendment was executed January 1, 1919, covering an increase in rates. The increase is equivalent to 23 per cent on the average load of the six years' life of the contract and is contemplated to offset increased generating costs.

During the year 1,009,147 kilowatt-hours of electrical energy were delivered to the city switchboard. This was a decrease of 17,853 kilowatt-hours over the previous year. This decrease was due to the effectiveness of a lightless night order of the Fuel Administration during the war and to a daylight saving order promulgated by Congress. During the month of June 3 interruptions from 25 minutes to 5 hours occurred, due to lightning striking the transmission line and destroying poles.

The commercial power operations show a loss of \$6,738.47 due principally, however, to a large amount of maintenance work necessarily taken on in connection with the resumption of irrigation operations inasmuch as the costs were prorated in proportion to the anticipated benefit of the maintenance work. This loss was further due to the rapid advance in labor and supply costs while the receipts from sales were fixed by contract. On January 1, 1919, a revised contract became effective at increased rates which resulted in profits for the last two months of the fiscal year.

Sale of commercial power, North Dakota pumping project.

	Cost.		Collection.		Profit or loss.	
	This month, fiscal year 1919.	Total, Dec. 20, 1912, to date.	This month, fiscal year 1919.	Total, Dec. 20, 1912, to date.	This month, fiscal year 1919.	Total, Dec. 20, 1912, to date.
1918.						
July.....	\$2,422.53	\$128,975.90	\$2,401.00	\$140,468.95	\$21.53	\$11,493.05
August.....	2,660.28	131,636.18	2,391.00	142,859.95	269.28	11,223.77
September.....	2,776.24	134,412.42	2,453.00	145,312.95	323.24	10,900.53
October.....	3,076.38	137,488.80	2,719.78	148,032.73	356.60	10,543.93
November.....	4,572.82	142,061.62	2,833.50	150,866.23	1,739.32	8,804.61
December.....	4,891.47	146,953.09	3,144.00	154,010.23	1,747.47	7,057.14
Subtotal.....	20,399.72		15,942.28		4,457.44	
1919.						
January.....	4,370.67	151,139.42	3,853.52	157,863.75	517.15	6,539.99
February.....	4,430.20	155,503.27	3,418.75	161,282.50	1,011.45	5,528.54
March.....	4,441.52	159,944.79	3,435.75	164,718.25	1,005.77	4,522.77
April.....	3,716.91	163,661.70	3,167.13	167,885.38	549.78	3,972.99
May.....	2,622.63	166,284.33	3,073.08	170,958.46	450.45	4,423.44
June.....	2,757.18	169,041.51	2,973.05	173,931.51	215.87	4,639.31
Subtotal.....	22,339.11		19,921.28		2,417.83	
Sales to employees.....						130.80
Grand total.....	42,738.83	169,041.51	35,863.56	173,931.51	6,875.27	4,770.11

¹ Loss.² Totals to date; not column totals.

OPERATION AND MAINTENANCE.

During the fiscal year 1919 the power plant, coal mine, and transmission line to Williston were operated. The water users and land-owners completed the organization of the Williston irrigation district and executed a contract based upon the requirements of the Secretary of the Interior. The Secretary approved the contract April 5, 1919, preparations for irrigation were hastened, and the irrigation of lands began on schedule time June 1, 1919.

June, the last month of the fiscal year and the first of the irrigation season, opened with a deficiency of moisture and remained very dry; consequently there was a comparatively large demand for irrigation water, with prospects for more extensive irrigation before the close of the irrigation season.

Historical review, North Dakota pumping project.

WILLISTON UNIT.

Item.	1914	1915	1916	1917	1918	1919
Area for which service was prepared to supply water..	8,189	8,189	8,189	8,189	8,189	8,189
Acreage irrigated.....	1,056					1,177
Miles of canal operated.....	30					27
Water diverted (acre-feet).....	2,671					1,717
Water delivered to land (acre-feet).....	1,792					991
Water per acre of land irrigated (acre-feet).....	1.70					.86

BUFORD-TRENTON UNIT.

Area for which service was prepared to supply water..	4,049	4,049	4,049	4,049	4,049	4,049
---	-------	-------	-------	-------	-------	-------

SETTLEMENT.

Settlement remained practically stationary because of the suspension of irrigation operations. After April 15, 1919, there was some return of landowners to their farms in order to prepare for irrigation during the season of 1919. This movement was small because of the lateness of the approval of the irrigation district contract and the backwardness of the season. Much of the land was sown to spring wheat which would have been sufficiently prepared for irrigation had the owners had another month of time. As the year closed, however, there is a marked improvement in the project lands and especially in the crops as compared with the nonirrigated crops.

Settlement data, North Dakota pumping project.

WILLISTON UNIT.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	93	101	101	105	105	105
Population.....	146	163	175	190	195	200
Total number of irrigated farms.....	26	44				
Operated by owners or managers...	18	34	34	34	33	33
Operated by tenants.....	8	10	10	10	11	24
Population.....	72	140	152	155	160	181
Number of towns.....	2	2	2	2	2	2
Population.....	4,700	5,000	5,000	5,300	5,380	5,400
Population in towns and on farms.....	4,846	5,183	5,175	5,490	5,555	5,600
Number of public schools.....	4	5	5	6	6	6
Number of churches.....	5	6	6	6	6	6
Number of banks.....	3	3	3	4	4	4
Total capital stock.....		\$135,000	\$185,000	\$235,000	\$280,000	\$260,000
Amount of deposits.....		\$1,300,000	\$1,500,000	\$1,800,000	\$2,000,000	\$1,756,000
Number of depositors.....		3,000	3,300	3,500	3,800	3,600

Settlement data, North Dakota pumping project—Continued.

BUFORD-TRENTON UNIT.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	33	42	42	42	42	42
Population.....	69	70	70	70	70	70
Number of irrigated farms.....						
Operated by owners or managers....	10	19	19	19	19	19
Operated by tenants.....	23	23	23	23	23	23
Number of towns.....	2	2	2	2	2	2
Population.....	350	350	400	400	425	425
Total population on farms and in towns.	419	420	470	470	495	495
Number of churches.....	2	2	2	2	2	2
Number of banks.....	1	2	2	2	2	2
Total capital stock.....	\$10,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
Amount of deposits.....	\$100,000	\$115,000	\$115,000	\$120,000	\$110,000	\$110,000
Number of depositors.....	200	240	240	250	260	260

PRINCIPAL CROPS.

The principal crop this year will of necessity be grain. A few tracts of old alfalfa were revived by the early water and will be restored to former productivity. Approximately 25 per cent of the grain acreage is nurse crop for alfalfa, assuring a new start in alfalfa in 1920. This is one of the most valuable results of the 1919 season, although the war price guaranteed for wheat assures a good return from that crop. Potatoes are doing well. A considerable acreage, prepared too late for grain, was put in millet and other feed crops and, with water, will carry the stock over to next year.

FINANCIAL STATEMENT.

Condensed balance sheet, North Dakota pumping project, June 30, 1919.

Inventory of material and supplies on hand.....	\$13,606.74
Accounts receivable.....	297,110.79
Gross construction cost.....	\$721,163.23
Less construction revenue earnings.....	9,472.27
Net construction cost.....	711,690.96
Gross operation and maintenance cost.....	272,277.67
Less operation and maintenance earnings.....	4,633.29
	267,644.38
Accounts payable.....	10,183.64
Collections and contracts of specific amounts for repayments to reclamation fund.....	291,438.18
Miscellaneous accruals.....	29,945.48
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	1,376,345.42
Collection, transfer, refund, and joint construction vouchers issued.....	417,859.85
Net investment.....	958,485.57

Feature costs of North Dakota pumping project to June 30, 1919.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....		\$44,969.88
Lateral system:		
Williston unit.....		141,292.00
Buford-Trenton unit.....		58,408.83
		199,699.78
Power system:		
Williston unit—		
Coal mine.....		14,224.61
Williston barge.....		39,647.14
Williston transmission line.....		16,439.30
Pumping station No. 4.....		8,281.60
Pumping station No. 2.....		14,065.76
Williston power house.....		176,803.30
Transformer station at barge.....		2,742.19
Floating boom at barge.....		772.64
Scow pontoon.....		1,411.33
Buford-Trenton unit—		
Buford-Trenton transmission line.....		25,345.99
Buford-Trenton barge.....		36,583.53
Pumping substation A.....		36,127.77
Boom and scow pontoon.....		787.60
Extension to Williston power house.....		76,329.36
		449,562.12
Permanent improvements and lands:		
Williston unit.....	\$5,105.62	22,712.06
Buford-Trenton unit.....		5,850.13
		28,562.21
Operation and maintenance charges transferred to and compounded with construction charges.....		22,191.93
Total cost of construction features.....	5,105.62	744,965.87
Unadjusted clearing accounts:		
Buford-Trenton construction materials and equipment sold—		
Buford-Trenton barge.....	¹ 2,696.94	¹ 5,329.64
Buford-Trenton pumping substation A.....	¹ 11,172.25	¹ 12,130.79
Miscellaneous salvage.....	11.00	¹ 17.81
Transmission line.....	¹ 6,895.11	¹ 6,454.40
	¹ 20,743.30	¹ 23,832.64
Gross construction cost to June 30, 1919.....	¹ 15,637.68	721,168.28
Less revenues earned during construction period:		
Rentals of buildings.....		3,780.44
Rentals of irrigation water.....		196.75
Contractors' freight refunds.....		5,495.08
		9,472.27
Net construction cost to June 30, 1919.....	¹ 15,637.68	711,696.06

¹ Deduct.

Statement of cost by calendar years, North Dakota pumping project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending Dec. 31—			
1907.....	\$428,985.77		\$428,985.77
1908.....	202,774.81	\$34,444.47	237,219.28
1909.....	69,221.31	45,106.43	114,327.74
1910.....	12,432.17	41,915.42	54,347.59
1911.....	5,392.45	35,206.63	40,599.08
1912.....	¹ 988.70	49,650.74	48,662.04
1913.....	¹ 4,666.33	47,049.05	42,382.72
1914.....		51,114.82	51,114.82
1915.....	26,728.77	4,473.36	31,202.12
1916.....		26,014.45	26,014.45
1917.....		² 85,799.78	² 85,799.78
1918.....	² 23,102.46	¹ 1,552.71	¹ 24,655.17
Jan. 1 to June 30, 1919.....	4,385.44	19,447.55	23,832.99
Subtotal.....	721,163.23	267,070.42	988,233.65
Plant accounts to June 30, 1919.....		5,207.25	5,207.25
Total.....	721,163.23	272,277.67	993,440.90

¹ Decrease.

² Decrease due to transfer of cost of producing commercial power to net power revenues.

³ Decrease due to sale of Buford-Trenton equipment.

⁴ Decrease due to distribution of estimated plant depreciation.

Statement of cost by fiscal years, North Dakota pumping project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending June 30—			
1907.....	\$182,924.99		\$182,924.99
1908.....	380,539.00		380,539.00
1909.....	128,193.39	\$55,133.54	183,326.93
1910.....	12,402.55	42,965.45	55,368.00
1911.....	9,354.13	37,633.27	46,987.40
1912.....	4,403.75	36,447.97	40,851.72
1913.....	¹ 4,961.03	58,988.25	54,007.22
1914.....	294.70	48,617.27	48,911.97
1915.....	22,191.93	20,179.98	42,371.91
1916.....	4,536.84	21,611.13	26,147.97
1917.....		¹ 72,084.56	¹ 72,084.56
1918.....	² 3,079.34	¹ 6,131.54	¹ 9,210.88
1919.....	² 15,637.68	23,729.66	8,091.98
Subtotal.....	721,163.23	267,070.42	988,233.65
Plant accounts on June 30, 1919.....		5,207.25	5,207.25
Total.....	721,163.23	272,277.67	993,440.90

¹ Decrease.

² Decrease due to sale of Buford-Trenton equipment.

Estimated cost of contemplated work, North Dakota pumping project, fiscal year 1920.

Principal features.	Estimated cost.
Operation and maintenance under public notice.....	\$84,000
Reimbursable accounts.....	1,000
Total.....	85,000

Operating costs and revenues, North Dakota pumping project.

COSTS.	Calendar year 1918.			To end of calendar year.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
Pumping for irrigation:						
Williston pumping station No. 1.		\$73.22	\$73.22	\$240.88	\$149.47	\$390.35
Williston pumping station No. 2.	\$244.98	.50	244.48	2,932.72	781.01	3,713.73
Williston pumping station No. 3.	449.93	56.76	394.17	21,610.45	4,711.75	26,322.20
Williston pumping station No. 4.	136.17		136.17	2,213.19	468.54	2,681.73
Buford pumping station No. 1.	737.32	61.18	676.14	22,912.84	3,488.36	26,401.20
Buford pumping station No. 2.	396.17		396.17	26,655.32	6,011.96	32,667.28
Williston power house irrigation.	4,147.43	2,353.84	1,793.59	89,550.96	26,221.08	115,772.04
Williston transmission line.	176.28	321.47	145.19	633.12	966.60	1,599.72
Buford-Trenton transmission line.	525.09		525.09	3,047.23	1,892.38	4,939.61
Williston telephone system.	13.14	72.81	59.67	583.13	292.67	875.80
Buford-Trenton telephone system.				1,087.27	155.13	1,242.40
Buildings.		993.74	993.74		5,824.16	5,824.16
Total pumping for irrigation.	6,826.51	3,932.52	2,893.99	171,467.11	50,963.11	222,430.22
Lateral system:						
Williston unit.		1,341.28	1,341.28	17,369.35	12,055.02	29,424.37
Buford-Trenton unit.				7,100.90	1,528.77	8,629.67
Total lateral system.		1,341.28	1,341.28	24,470.25	13,583.79	38,054.04
Commercial power, preparatory.				9,330.54		9,330.54
Subtotal.	6,826.51	5,273.80	1,552.71	205,267.90	64,546.90	269,814.80
Less unpaid operation and maintenance charges added to construction.						22,191.93
Total.						247,622.87
REVENUES.						
Operation and maintenance charges accrued on contract with water-right applicants.			\$61.60			\$24,278.91
Operation and maintenance charges paid in advance by water-right applicants.						101.20
Operation and maintenance paid and forfeited by water-right applicants.			61.60			217.87
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.						45.41
Rental of lands and buildings during operating period.			269.18			3,108.93
Rental of irrigating water.						2,751.83
Other revenues, unclassified, earned during operating period.			\$1.04			1,445.74
Total.			268.14			31,949.89
Difference:						
Excess.			1,820.85			
Deficit.						215,672.98

¹ Credit due to distribution of estimated plant depreciation, \$7,296.07.² Deduct.

OREGON, UMATILLA PROJECT.

H. M. SCHILLING, project manager, Hermiston, Oreg.

LOCATION.

Counties: Umatilla and Morrow.

Townships: 4 and 5 N., Rs. 24, 25, 26, 27, 28, and 29 E., Willamette meridian.

Railroads: Oregon-Washington Railroad & Navigation Co.; Spokane, Portland & Seattle R. R.

Railroad stations and estimated population June 30, 1919: Hermiston, 650; Umatilla, 300; Irrigon, 75; Boardman, 75; Messner and Hinkle, junction points.

WATER SUPPLY.

Source of water supply: Umatilla River.

Area of drainage basin: 2,160 square miles.

Annual run-off in acre-feet: Umatilla River at Yoakum (1,200 square miles), 1903 to 1918, maximum, 746,000; minimum, 250,000; mean, 526,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which Service is prepared to supply water, season of 1919: 24,658 acres.

Area under water-right applications, season of 1919: 19,215 acres.

Length of irrigation season: From March 20 to October 16—210 days.

Average elevation of irrigable area: 470 feet above sea level.

Rainfall on irrigable area: Average, 8.5 inches; 1918, 6.5 inches.

Range of temperature on irrigable area: -28° to 115° F. (ordinary minimum, 0° F.).

Character of soil, irrigable area: Sandy loam.

Principal products: Alfalfa, fruits, berries, vegetables.

Principal markets: Portland, Oreg.; Spokane and Seattle, Wash.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: December 27, 1907; August 3 and November 12, 1908; April 3, 1909; January 6, 1910 (two); February 28 and May 16, 1911; March 2 and May 8, 1912; March 3, April 7, June 23, July 15, and July 21, 1913; January 19 and September 24, 1914; February 25, April 5, and December 12, 1915 (two); March 16, April 12 (three), May 12, May 27, September 21, December 18, 1916; January 2, January 5, February 8, February 23, March 23, April 20, April 23, and December 11, 1917; January 2, January 26, January 30, February 6, February 7, February 16, March 8, April 3, July 16, and November 25, 1918; March 12, May 24 and June 27, 1919.

Location of lands opened: Ts. 4 and 5 N., Rs. 24, 25, 26, 27, 28, and 29 E., Willamette meridian.

Limit of area of farm units: Public, 40 acres; private, 160 acres.

Duty of water: Beneficial use.

Building charge per acre of irrigable land: \$60, \$70, and \$92.

Annual operation and maintenance charge: Minimum charge 1918, \$1.75 per acre.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1903.

Construction recommended by board of engineers October 27, 1905.

Construction authorized by Secretary December 4, 1905.

Diversion dam and feed canal completed August, 1907.

Cold Springs Dam completed June, 1908.

First irrigation by Reclamation Service, season of 1908.

Construction of west extension authorized December 22, 1913.

West Extension (Three Mile Falls) Diversion Dam completed November 28, 1914.

West Extension Main Canal completed June, 1916.

Entire project (including west extension) 94 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Umatilla project provides for the diversion of water from the Umatilla River above Echo, Oreg., through a feed canal 24.5 miles long, into a storage reservoir. Water is diverted from the reservoir through an outlet canal, also from the feed canal by means of a by-pass connecting the feed and outlet canals. Water is also diverted from the Umatilla River by the Maxwell Canal, heading near Butter Creek, and delivered into a distribution system from the reservoir, thus watering land in the Umatilla and Columbia River Valleys near Hermiston, Oreg. In addition some 11,300 acres bordering the Columbia River in the vicinity of Umatilla, Irrigon, and Boardman, Oreg., will be watered by a canal diverting from the Umatilla River about halfway between Hermiston and Umatilla.

The United States intends, for and in connection with the project, to use the waste, seepage, spring, and percolating water arising within the same, and asserts a right thereto by virtue of its reservation of all unappropriated waters of the project source of supply and of its appropriation of said waters in accordance with the State law, heretofore made, for the purpose of the project.

The features which have been completed are the diversion works above Echo, feed canal, Cold Springs Dam, by-pass, diversion works for the Maxwell Canal, diversion works for the west extension, main distributary from Cold Springs Reservoir, main distributary for the west extension, and laterals for the irrigable area now opened. Four drain ditches have been built. The main construction work in progress is the building of laterals in the west extension, also supplemental construction for lands east of the Umatilla River in order to deliver water as near as may be to the most commanding point of each 40 acres.

SUMMARY OF GENERAL DATA FOR UMATILLA PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	36, 300
Public land entered to June 30, 1919.....	5, 078
Public land open to entry on June 30, 1919.....	294
Public land withdrawn on June 30, 1919.....	2, 398
Railroad land June 30, 1919.....	3, 342
Private land June 30, 1919.....	25, 188
Acreage service could have supplied in season of 1918.....	24, 658
Estimated acreage service can supply in season 1919.....	24, 658
Estimated acreage service can supply in season 1920.....	25, 000
Acreage irrigated season of 1918.....	9, 100
Acreage cropped under irrigation, season of 1918.....	6, 819

Crops:

Value of irrigated crops, season of 1918.....	\$400, 642. 00
Value of irrigated crops per acre cropped.....	\$58. 75

Finances:

Net construction cost to June 30, 1919.....	\$2, 439, 732. 10
Per cent completed on June 30, 1919.....	94
Appropriated for fiscal year 1920.....	\$113, 000. 00
Estimated per cent complete by June 30, 1920.....	96
Proposed appropriation for fiscal year 1921.....	\$170, 000. 00
Estimated per cent complete by June 30, 1921.....	98
Announced construction charges per acre.....	\$60, \$70, \$92

Appropriation for fiscal year 1919.....	\$80, 000. 00
Increase of compensation.....	4, 590. 31
Increase miscellaneous collections.....	31, 195. 68
Balance 1918 appropriation.....	91, 035. 48

\$206, 821. 47

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$92, 353. 40
Transfers.....	7, 785. 87
Current liabilities.....	4, 033. 14
Contingent liabilities.....	127. 78

104, 300. 19

Unencumbered balance on July 1, 1919..... 102, 521. 28

Repayments:

Value of construction water-right contracts.....	\$1, 581, 457. 32
Construction charges—	
Accrued to June 30, 1919.....	332, 826. 11
Collected to June 30, 1919.....	318, 492. 33
Uncollected on June 30, 1919.....	14, 333. 78
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	153, 056. 97
Collected to June 30, 1919.....	131, 742. 74
Uncollected on June 30, 1919.....	21, 314. 23
Water-rental charges—	
Accrued to June 30, 1919.....	21, 856. 59
Collected to June 30, 1919.....	21, 328. 66
Uncollected on June 30, 1919.....	527. 93

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	200
Miles of open drains built to June 30, 1919.....	10
Estimated acreage protected by drains to June 30, 1919.....	2, 000
Estimated acreage to be protected by authorized system.....	2, 000
Cost of drainage works to June 30, 1919.....	\$54, 812. 63

CONSTRUCTION DURING FISCAL YEAR.

Distribution system, east side.—Fourteen thousand four hundred linear feet of small laterals were built as supplemental construction for five small districts. Four districts were completed. The work done consisted in laying 2,960 linear feet of 16-inch and 3,400 linear feet of 20-inch cement pipe. In addition 1,375 linear feet of lateral were lined with concrete 2 inches thick, involving the placing of 75 cubic yards or 1,344 square yards of concrete. Twenty-five minor structures were built, requiring 25 cubic yards of concrete. Pipe yard operations, involving the making of 872 linear feet of 12-inch, 6,782 linear feet of 16-inch, and 5,086 linear feet of 20-inch cement pipe, were carried on.

Supplemental construction for one small district was begun but will not be completed until some time during the coming year.

West extension.—Two thousand six hundred and fifty-two linear feet of laterals were built. The work done consisted in laying 1,316 linear feet of 16-inch and 1,356 linear feet of 20-inch cement pipe. In addition 8 minor structures were built, involving the placing of 15 cubic yards of concrete; 220 linear feet of laterals were lined with concrete 2 inches thick involving the placing of 6 cubic yards or 114 square yards of concrete; and concrete footings were constructed and placed under the barrel flume, requiring 26 cubic yards of concrete. A patrolman's cottage at the Three Mile Falls dam was constructed.

OPERATION AND MAINTENANCE.

Diversion of water to the feed canal for storage purposes was resumed November 25, 1918, and was continued until June 1, 1919. Cold Springs Reservoir reached a maximum storage of 47,700 acre-feet on May 31, 1919. The low flow of the Umatilla River precluded a maximum diversion until about February 1. Almost a

maximum diversion was maintained, however, from that time until June 1. Water to the amount of 91,517 acre-feet was diverted by the feed canal, of which 1,345 acre-feet were wasted, 10,819 acre-feet were delivered under the Cunha contract, and 70,064 acre-feet delivered to Cold Springs Reservoir. Available storage on June 30, 1919, was 36,900 acre-feet.

Delivery of water to the distribution system began March 6. The total discharge from the reservoir to June 30 was 27,510 acre-feet. Delivery of water to the Maxwell Canal began March 1. The total diversions to June 30 were 11,750 acre-feet. The irrigable area of holdings on that portion of the project east of the Umatilla River is estimated to be 12,000 acres and the area actually irrigated approximately 8,500 acres.

West extension.—Diversions of water by the west extension main canal were continuous throughout the year. The irrigation season of 1918 ended November 1. The irrigation season of 1919 began April 1. Diversions between the irrigation seasons were for sluicing operations. Approximately 10,000 acre-feet were diverted for irrigation purposes to June 30. About 2,000 acres have been irrigated. Sluicing operations in the main canal resulted in ample canal capacity for irrigation purposes.

Historical review, Umatilla project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	17,587	16,000	19,000	24,247	24,658	¹ 24,658
Miles of canal operated.....	112	112	163	165	177	180.2
Acreage irrigated.....	5,100	5,300	5,900	7,327	9,100	10,500
Water diverted (acre-feet).....	59,900	86,200	93,000	99,900	118,154	162,850
Water delivered to land (acre-feet).....	36,300	29,550	34,380	45,365	48,163	53,500
Per acre of land irrigated (acre-feet).....	7.10	5.57	5.83	6.19	5.61	5.1

¹ Estimated.

SETTLEMENT.

The population of the project in 1918 was 2,400, about half living on farms, the other half in the four project towns of Hermiston, Umatilla, Irrigon, and Boardman.

Settlement data, Umatilla project.

Item.	1916	1917	1918	1919 ¹
Total number of farms on project.....	² 745	² 800	² 869	² 875
Population.....	975	1,024	1,127	1,200
Number of irrigated farms.....	364	411	459	500
Operated by owners or managers.....	216	302	339	350
Operated by tenants.....	148	109	120	150
Population.....	975	1,024	1,200	1,200
Number of towns.....	4	4	4	4
Population.....	1,225	1,100	1,200	1,400
Population in towns and on farms.....	2,200	2,124	2,327	2,600
Number of schools (public).....	6	6	6	6
Number of churches.....	9	9	9	9
Number of banks.....	1	1	1	1
Total capital stock.....	\$25,000	\$25,000	\$25,000	\$25,000
Amount of deposits.....	\$99,000	\$157,000	\$170,000	\$232,000
Number of depositors.....	845	960	1,000	1,129

¹ Estimated.

² Number of water-right applications and rental contracts.

PRINCIPAL CROPS.

During 1918 approximately 9,100 acres were irrigated and 6,819 acres cropped, the difference being mainly areas in new seedings of alfalfa. The total value of the crops was \$400,640 as compared with \$311,400 during 1917. Continued war prices created an abnormal crop value. The year was favorable for alfalfa but the fruit crop was practically a failure.

The agricultural situation for 1919 is on the whole excellent. There will be some fruit losses, but all other crops are in flourishing condition.

Crop report, Umatilla project, Oregon, 1918.

Crop.	Area (acres).	Unit of yield.	Yields.			Values.	
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	5,274	Ton.....	19,063	3.6	\$17.84	\$340,083	\$64.48
Alfalfa seed.....	117	Bushel.....	591	5.1	10.75	6,353	54.30
Apples.....	418	Pounds.....	103,800	(1)	.0320	3,322	7.95
Cane sirup.....	7	Gallon.....	523	74.7	1.46	764	109.14
Barley.....	48	Bushel.....	555	11.6	1.36	755	15.73
Corn, Indian.....	252	do.....	6,403	25.4	1.53	9,796	38.87
Corn, sorghum.....	4	do.....	145	36.2	1.38	200	50.00
Corn, fodder.....	114	Ton.....	778	6.8	7.02	5,462	47.91
Fruits, small.....	57	.....	.....	.....	.....	3,140	55.09
Garden.....	66	.....	.....	.....	.....	6,524	98.85
Hay.....	368	Ton.....	407	1.1	8.94	3,639	9.89
Oats.....	1	Bushel.....	16	16	1.00	16	16.00
Peaches.....	110	Pound.....	.....	(1)	.....	1,135	10.32
Pears.....	6	do.....	23,426	3,904	.038	890	148.33
Pasture.....	774	.....	.....	.....	.....	10,003	12.92
Potatoes.....	49	Bushel.....	3,296	65.2	1.334	4,397	89.73
Prunes.....	2	Pound.....	6,000	.....	.05	200	150.00
Rye.....	33	Bushel.....	175	5.3	2.15	376	11.40
Vetch seed.....	23	do.....	63	2.7	13.00	819	35.17
Wheat.....	31	do.....	449	14.5	2.22	997	32.16
Miscellaneous.....	35	.....	.....	.....	.....	1,671	47.74
Less duplicated areas.....	970	.....	.....	.....	.....	.....	.....
Total cropped acreage.....	6,819	Total and average.....	.....	.....	.....	400,642	58.75
		Areas.	Acres.		Farms.	Per cent of project of 26,300 acres.	
Irrigated, no crop:							
Nonbearing orchard.....	427	Irrigable area farms reported.....		15,110	459	57.5	
Young alfalfa.....	1,548	Irrigated area farms reported.....		9,100	459	34.6	
Ground, fall plowed.....	83	Miscellaneous.....		1,293	90	4.9	
Miscellaneous.....	336	Under water right applications.....		7,305	344	27.8	
Less duplicated areas.....	113	Under rental contracts.....		502	32	1.9	
Total irrigated acreage.....	9,100	Cropped area farms reported.....		6,819	.....	25.9	

¹ Crop failure.

² Maxwell rental contract lands, 199 acres; vested water right, 63 acres; Maxwell water right, 289 acres; departmental regulations, 37 acres; sandy area, 705 acres; 7 farms duplicated.

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, JULY 16, 1918.

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), public notice is given, that upon proper application being made therefor, water will be furnished under the

Umatilla project, Oregon, in the irrigation season of 1918 and thereafter, for the irrigable lands of the SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ of sec. 35, T. 5 N., R. 26 E., W. M., subject to terms and conditions of the public notice issued for the third unit of the west extension of said project, February 7, 1918.

S. G. HOPKINS,

Assistant Secretary of the Interior.

PUBLIC NOTICE, NOVEMBER 25, 1918.

1. **Supplemental construction—Change in character of works.**—Under the provisions of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly section 4 of the reclamation extension act of August 13, 1914 (38 Stat., 686), a majority of the water right applicants and owners of the lands included in district No. 22 of the Umatilla project, Oregon, have made agreements providing for an increase in the cost of construction in the sum of \$20 per irrigable acre. Public notice ratifying said agreements was promulgated February 16, 1918. A majority of the water right applicants and owners of land in said district have since made supplemental agreements under which the character of the work to be done is changed and is now described as follows: The construction of a 20-inch cement pipe line, about 1,750 feet long, and a distributary, from the outlet of said pipe, extending about 900 feet.

2. **Ratification.**—The said supplemental agreements are hereby ratified and confirmed. The public notice of February 16, 1918, is hereby amended to such extent and purpose, otherwise to remain in full force and effect.

E. C. BRADLEY,

Assistant to the Secretary of the Interior.

PUBLIC NOTICE, MARCH 12, 1919.

1. **Annual operation and maintenance charge.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice against all lands of the Umatilla project, Oregon, under public notice, shall be as follows: For lands of the west extension a minimum charge of \$2 per irrigable acre, whether water is used thereon or not, which minimum charge will entitle the water user to 3 acre-feet of water per irrigable acre, and for all other lands a minimum charge of \$2 per irrigable acre, whether water is used thereon or not, which minimum charge will entitle the water user to 4 acre-feet of water per irrigable acre. Additional supplies will be furnished for all lands at the following rates: The first acre-foot for 50 cents, the next acre-foot for 75 cents, and each acre-foot thereafter for \$1: *Provided*, That for lands seeded during the current irrigation season to alfalfa for the first time, the additional supply of water will be furnished for 25 cents per acre-foot. All operation and maintenance charges under the project will be due

and payable on March 1 following the irrigation season; but where water right application is made for public land entered under the reclamation law after June 15, or where water right application is made after August 1 for land in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which water right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, MAY 24, 1919.

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, and in accordance with the agreements described in section 3 hereof, providing for additional construction for lands having vested water rights from the system of the Oregon Land & Water Co., and being located in the west extension of the Umatilla project, Oregon, public notice is hereby issued as follows:

2. **Classification of lands.**—The lands under the system of the Oregon Land & Water Co. have been classified according to the value of their vested rights and for reference purposes are designated herein as class A, class B, class C, and class D.

3. **Lands for which water will be furnished.**—The necessary construction work having been performed, water will be furnished under said project in the irrigation season of 1919 and thereafter, for the irrigable lands referred to in the list which follows. The different tracts of land covered by this notice are described in numbered deeds issued by the Oregon Land & Water Co., and also in contracts between the landowners and the United States. The list below divides these lands according to classes, gives the respective numbers of the Oregon Land & Water Co. deeds, names of contracting landowners, dates of contracts, areas of lands and volume and page numbers of the records of the contracts in the county records of Oregon, to wit:

LANDS IN CLASS A.

No. O. L. & W. Co. deed.	Contracting land owner.	Date of contract.	Area.	Volume and page number county record.	County in which recorded.
1	D. R. Brownell.....	May 5, 1917	26.5	99-274	Umatilla.
2	Ella R. Walpole.....	May 31, 1916	10.17	30-179	Morrow.
3	Mary J. Dexter.....	Oct. 4, 1916	5.18	99-56	Umatilla.
4	Mary E. McNurten.....	May 6, 1916	6.7	99-50	Do.
6	Emily Doering.....	Apr. 27, 1916	30.16	30-283	Morrow.
7	J. S. Cabbage.....	Apr. 17, 1916	10	30-325	Do.
10	Burtis L. Jenkins.....	Jan. 6, 1916	5	30-251	Do.
14	Melia Sargent.....	Sept. 11, 1916	5	30-247	Do.
16	Emma O. Hibbard.....	May 6, 1916	26.97	30-245	Do.
17	do.....	do.....	5.17	30-213	Do.
18	Helen H. Conklin.....	Aug. 10, 1916	5	30-173	Do.
13	J. W. Brackenbury.....	Mar. 25, 1919	5	33-75	Do.
19	T. J. George.....	Apr. 28, 1916	4.73	99-66	Umatilla.
20	Eliza J. Rider.....	Apr. 24, 1916	7.55	30-261	Morrow.
21	Peter Sushauer.....	Apr. 17, 1916	8	30-265	Do.
24	A. A. Anthony.....	May 8, 1916	8.47	30-329	Do.
26	J. H. Smith.....	May 29, 1916	5.95	30-259	Do.
27	J. L. Egbert.....	Apr. 17, 1916	5	30-161	Do.
28	F. H. Denson.....	do.....	4	30-323	Do.
29	Nancy Jane Ricks.....	May 9, 1916	4.2	99-45	Umatilla.
30	Alvah Strong.....	Oct. 3, 1916	5	30-327	Morrow.
32	Thurston Grim.....	Apr. 17, 1916	12.25	30-293	Do.

LANDS IN CLASS A—Continued.

No. O. L. & W. Co. deed.	Contracting land owner.	Date of contract.	Area.	Volume and page number county record.	County in which recorded.
37	T. W. Osgood	Apr. 17, 1916	6.53	30-289	Morrow.
38	N. Seaman	Apr. 15, 1916	5	30-301	Do.
39	J. E. Henkle	July 17, 1916	7.17	30-165	Do.
41	Winifred B. Harper	Apr. 17, 1916	5	30-269	Do.
42	H. H. Edwards	Apr. 22, 1916	3.06	99-72	Umatilla.
43	R. Vernon Jones	do.	15.54	30-273	Morrow.
45	George Rand	Apr. 21, 1916	10	30-281	Do.
46	George Blume	Apr. 10, 1916	5	30-331	Do.
47	A. W. Beachler	May 10, 1916	5	30-177	Do.
48	Peter Susbauer	Apr. 17, 1916	6.65	30-297	Do.
49	Lettie D. Holbrook	Aug. 21, 1916	8.44	30-211	Do.
50	Chas. H. Benedict	May 9, 1916	5.15	30-239	Do.
53	W. T. Bray	Jan. 30, 1919	4.58	33-53	Do.
51	Grant S. Potter	Sept. 1, 1916	12.03	30-235	Do.
55	Florence N. Kent	May 15, 1916	9.45	30-233	Do.
58	L. A. Doble	July 3, 1916	5	30-227	Do.
59	Peter Susbauer	Apr. 17, 1916	18.22	30-295	Do.
60	Alfred Ives	May 15, 1916	5	30-167	Do.
61	C. H. Ives	do.	5.13	30-231	Do.
62	A. E. McFarland	Apr. 29, 1916	12.29	99-121	Umatilla.
67	J. W. Brackenbury	Mar. 25, 1919	5	33-81	Morrow.
70	Philander Bishop	Apr. 22, 1916	5.09	30-319	Do.
71	Margaret C. Broughol	Apr. 29, 1916	5	30-319	Do.
73	Frank L. Wait	May 15, 1916	7.06	30-221	Do.
74	Harriet H. Wait	do.	5	30-222	Do.
75	S. L. Carson	May 19, 1916	6.12	30-217	Do.
76	Fred Ricks	Apr. 20, 1916	15.09	30-267	Do.
77	Charles W. Caldwell	Apr. 17, 1916	16.38	30-277	Do.
78	L. M. Davis	Mar. 4, 1919	5	33-71	Do.
79	Charles P. Cahoon	Feb. 25, 1916	10.27	30-339	Do.
80	P. E. Lynne	June 20, 1916	10.00	30-219	Do.
81	W. S. Hunt	May 12, 1916	5.27	30-215	Do.
82	Lucius A. Doble	July 2, 1916	19.69	30-171	Do.
83	T. A. Cronk	Apr. 22, 1916	5	30-255	Do.
86	J. W. Brackenbury	Mar. 25, 1919	5	33-77	Do.
89	Jennie B. Corey	Apr. 20, 1916	16.29	30-307	Do.
90	George Susbauer	Aug. 30, 1916	4.87	30-213	Do.
92	A. H. Johnson	Apr. 26, 1916	10	30-305	Do.
93	A. H. Allen	Feb. 15, 1919	7.20	33-65	Do.
95	W. S. Hunt	May 12, 1916	5	30-211	Do.
97	B. Farrell	July 15, 1916	5	30-200	Do.
98	Walter Blackburn	May 11, 1916	5	30-169	Do.
102	W. R. Walpole	May 31, 1916	5	30-207	Do.
103	H. H. Edwards	Apr. 22, 1916	3.2	99-132	Umatilla.
104	J. M. McCaw	Oct. 6, 1916	10	30-253	Morrow.
105	G. O. Davis	June 5, 1916	10	30-181	Do.
106	Philander Bishop	Oct. 2, 1916	6.05	31-53	Do.
107	C. Alexander McCabe	Sept. 29, 1916	5	30-541	Do.
108	Ella R. Walpole	May 31, 1916	5	30-205	Do.
109	do	do.	5	30-203	Do.
115	Elmer Brown	June 24, 1916	5	99-39	Umatilla.
117	D. W. Price	May 12, 1916	4.98	30-201	Morrow.
118	George Rand	Apr. 21, 1916	8	30-271	Do.
119	J. A. Yeomans	do.	5	30-285	Do.
120	W. A. Walpole	May 31, 1916	5	30-199	Do.
122	F. M. Pike	May 4, 1916	5	99-110	Umatilla.
123	H. H. Edwards	Apr. 22, 1916	7.74	99-94	Do.
128	T. H. Smith	Apr. 29, 1916	10	30-273	Morrow.
129	L. M. Davis	Mar. 4, 1919	6	33-85	Do.
130	Clyde E. Niles	July 11, 1916	7.64	30-193	Do.
131	W. M. Riggs	May 5, 1916	5.14	30-291	Do.
132	R. P. Pike	May 4, 1916	6	99-101	Umatilla.
134	D. Scharnhorst	Nov. 18, 1916	5.84	30-313	Morrow.
138	D. R. Brownell	Apr. 21, 1916	4.36	99-77	Umatilla.
140	Lester W. Lancaster	May 20, 1916	8.26	30-191	Morrow.
143	George Rand	Apr. 24, 1916	5	30-279	Do.
145	D. Scharnhorst	Nov. 18, 1916	5	30-345	Do.
125	W. R. Walpole	May 31, 1916	5	30-195	Do.
148	J. W. Walker	Apr. 25, 1917	5	30-547	Do.
147	A. H. Allen	Feb. 15, 1919	6.98	33-59	Do.
149	Nancy Jane Ricks	May 9, 1916	4.18	99-28	Umatilla.
150	L. Alboucq	Feb. 7, 1919	2.5	33-83	Morrow.
153	Walter S. Vail	Oct. 2, 1916	4	99-23	Umatilla.
158	Fred Ricks	Apr. 20, 1916	5.05	30-313	Morrow.
162	Ella R. Walpole	May 31, 1916	5	99-17	Umatilla.
164	Addison Bennett	Feb. 10, 1919	5	33-79	Morrow.
170	R. P. Pike	May 4, 1916	5	99-88	Umatilla.
173	Mike Donnelly	Feb. 10, 1919	5	33-61	Morrow.
177	W. T. Bray	Jan. 30, 1919	4.75	33-57	Do.
178	A. E. McFarland	Apr. 29, 1916	5	99-99	Umatilla.

LANDS IN CLASS B.

No. O. L. & W. Co. deed.	Contracting land owner.	Date of contract.	Area.	Volume and page number county record.	County in which recorded.
168	H. H. Edwards.....	Apr. 22, 1916	16.2	99-83	Umatilla.

LANDS IN CLASS C.

8	Amanda Dawson.....	Apr. 19, 1916	5	30-303	Morrow.
11	W. A. Walpole.....	May 31, 1916	5	30-249	Do.
22	Amanda Dawson.....	Apr. 19, 1916	5	30-299	Do.
35	J. L. Munro.....	May 1, 1916	9	30-321	Do.
51	Ella R. Walpole.....	May 31, 1916	5.96	30-237	Do.
52	Charles B. Dexter.....	Apr. 29, 1916	6	99-126	Umatilla.
56	John E. Aitchison.....	Nov. 11, 1916	9.08	30-333	Morrow.
65	Otis C. Henkle.....	May 29, 1916	5.27	30-227	Do.
96	Ella R. Walpole.....	May 31, 1916	5.13	30-335	Do.
124	W. R. Walpole.....	do.	5	30-197	Do.
127	Lillian P. Orr.....	Jan. 25, 1919	5.07	33-69	Do.
144	Joseph Geiger.....	Mar. 12, 1919	5.14	33-67	Do.
145	Ella R. Walpole.....	May 31, 1916	5.05	30-189	Do.
146	Estella J. Woodward.....	May 4, 1916	5.68	30-337	Do.
154	John Bottjer.....	Apr. 10, 1916	5.13	30-163	Do.
166	Harriette A. Olson.....	May 12, 1916	5.14	30-185	Do.
167	James T. Bullack.....	July 6, 1916	4.15	99-12	Umatilla.
167	Lawrence M. Bullack.....	June 12, 1916	4.15	99-6	Do.
169	William J. Locke.....	Apr. 22, 1916	5	30-275	Morrow.
171	Ernest C. Hamilton.....	May 6, 1916	5	30-183	Do.
172	George J. Currin.....	Apr. 21, 1916	5.86	30-311	Do.
174	J. A. Yeomans.....	Apr. 24, 1916	4.41	30-287	Do.
175	Mary E. Lester.....	May 6, 1916	10.75	30-257	Do.
176	Ira L. Hoffman.....	Feb. 23, 1916	11.84	30-175	Do.

LANDS IN CLASS D.

163	Kitty Alice McGill.....	Apr. 17, 1916	2.94	30-341	Morrow.
-----	-------------------------	---------------	------	--------	---------

4. **Classes of charges for water rights.**—The water-right charges are of two kinds, to wit: (1) A charge against each irrigable acre to cover cost of additional construction for the irrigation system, termed the additional construction charge; and (2) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system, termed the operation and maintenance charge.

5. **Additional construction charge.**—For lands covered by the above-described contracts the additional construction charge shall be as follows: For lands in class A, \$14 per irrigable acre; for lands in class B, \$15.65 per irrigable acre; for lands in class C, \$20 per irrigable acre; for lands in class D, \$33.10 per irrigable acre. Said charges in each case shall be paid in 10 equal annual instalments, the first of which shall be due and payable December 1, 1919, and subsequent instalments, on December 1 of each year thereafter.

6. **Advance payment of additional construction charge permissible.**—Any water contractor may, at his option, pay in advance the whole or any part of the additional construction charge owing by him within any shorter period than that prescribed by this notice.

7. **Operation and maintenance charge.**—The operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice shall be the same per acre of irrigable land whether

water is used thereon or not, as announced for the other lands under the west extension of the Umatilla project in public notice of March 12, 1919.

8. Place and method of payment of water-right charges.—All water-right charges must be paid at the office of the United States Reclamation Service at Hermiston, Oreg., in cash or by New York draft, or money order, payable to special fiscal agent, United States Reclamation Service.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, JUNE 27, 1919.

1. Lands for which water will be furnished.—Upon proper application being made therefor, water will be furnished under the Umatilla project, Oregon, in the irrigation season of 1919, and thereafter, for the irrigable lands described as follows, to wit:

Commencing at corner to secs. 16, 17, 20, and 21, Tp. 4 N., R. 28 E., W. M., thence due west 245 feet to point of beginning of this description; thence north 671½ feet to east bank of Umatilla River; thence downstream along east bank of Umatilla River as follows: South 55 degrees 00 minutes east 299 feet; thence south 41 degrees 40 minutes east 271 feet, thence south 60 degrees 33 minutes east 482 feet, thence south 76 degrees 34 minutes east 257 feet to a point where section line between sections 16 and 21 intersect the east bank of the Umatilla River; thence south 1,320 feet; thence west 1,095 feet; thence north 1,320 feet to place of beginning of this description, shown on a farm unit plat of T. 4 N., R. 28 E., W. M., approved February 11, 1911, and amended April 8, 1918, which plat is on file in the office of the project manager, United States Reclamation Service, Hermiston, Oreg., and the local land office at The Dalles, Oreg.

2. Limit of area for which water right may be secured.—The maximum limit of area for which water-right application may be made for lands in private ownership shall be 160 acres of irrigable land for each landowner.

3. Application for water right.—Water-right application must be made to the project manager, United States Reclamation Service, Hermiston, Oreg., upon a form provided for that purpose, and may be made on and after the date of this notice.

4. Classes of charges for water rights.—The water-right charges are of two kinds, to wit: (a) A charge against each irrigable acre to cover cost of construction of the irrigation system; and (b) an annual charge against each irrigable acre to cover cost of operation and maintenance of the system.

5. Construction charge.—The construction charge shall be \$70 per acre of irrigable land, payable as follows: An initial payment of 5 per cent of the construction charge shall be made at the time of filing water-right application, and the remainder of the construction charge shall be paid in 15 annual instalments, the first 5 of which shall each be 5 per cent and the remainder each 7 per cent of the total construction charge. The first of said 15 annual instalments

shall become due and payable December 1 of the fifth calendar year after the initial instalment, and subsequent instalments shall become due and payable on December 1 of each calendar year thereafter.

6. **Increased construction charge in certain cases.**—If water-right application is not to be made within one year from the date of this notice the construction charge will be increased 5 per cent each year until such application is made and an initial instalment is paid.

7. **Advance payment of construction charge permissible.**—The water-right applicant may, at his option, pay in advance the whole or any part of the construction charge owing by him within any shorter period than that prescribed by this notice.

8. **Operation and maintenance charges.**—The operation and maintenance charge for the irrigation season of 1919 and thereafter will be the same as for other like lands under the project, and will be due and payable on March 1 following the irrigation season.

9. **Place and method of payment of water-right charges.**—All water-right charges must be paid at the office of the United States Reclamation Service at Hermiston, Oreg., in cash, or by New York draft, or money order, payable to the special fiscal agent, United States Reclamation Service.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Umatilla project, June 30, 1919.

Cash.....		\$321. 28
Inventory of materials and supplies on hand.....		13, 273. 32
Accounts receivable:		
Current accounts receivable.....	\$36, 512. 44	
Construction water-right charges, unaccrued.....	1, 248, 631. 21	
		1, 285, 143. 65
Construction work contracted.....		127. 75
Gross construction cost.....	2, 473, 191. 46	
Less construction revenue earnings.....	33, 459. 36	
Net construction cost.....		2, 439, 732. 10
Gross operation and maintenance cost.....	337, 113. 31	
Less operation and maintenance earnings.....	29, 454. 17	
		357, 659. 14
Accounts payable.....		4, 041. 78
Contingent obligations.....		449. 01
Collections and contracts of specific amounts for repayments to reclamation fund.....		1, 795, 591. 47
Capital investment:		
Disbursement, transfer and joint construction vouchers received.....	3, 029, 795. 20	
Collection, transfer, refund, and joint construction vouchers issued.....	733, 620. 24	
Net investment.....		2, 296, 174. 96

Feature costs of Umatilla project.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
East side.....	\$7,951.56	\$58,685.35
West side.....		64,476.71
	7,951.56	123,162.06
Storage works, east side:		
Diversion dam and works.....		22,294.92
Feed canal.....		241,410.56
Cold Springs dam and works.....		464,644.11
		829,339.59
Canal system:		
Canal A, east side.....		45,477.85
Maxwell Diversion dam and works, east side.....		4,569.04
Maxwell Canal, east side.....		37,684.83
Three Mile Falls Diversion dam and works, west side.....		73,586.05
Main canal, west side.....		487,423.31
Oregon Land and Water Co. system, west side.....	78,364.00	78,364.00
	78,364.00	727,105.08
Lateral system:		
East side supplemental construction.....	9,539.57	57,998.28
East side laterals.....	4.55	428,931.56
West side laterals.....	6,529.25	191,238.61
	16,069.37	671,168.44
Drainage system:		
Hermiston drain.....		44,010.69
Second unit drain.....		3,174.60
Hat Rock drain.....		1,604.65
Umatilla drain.....		6,022.69
		54,812.63
Farm units:		
East side.....	17.72	1,896.00
West side.....	64.86	1,337.77
	82.58	3,233.77
Permanent improvements:		
Frame buildings, Hermiston, east side.....	1250.00	8,496.12
New office building, Hermiston, east side.....		6,454.70
Feed canal quarters, east side.....		3,019.98
Cold Springs dam buildings, east side.....		3,573.39
Demonstration farm buildings, east side.....		8,421.47
Warehouse, Irrigon, west side.....		947.21
Boardman quarters, west side.....	729.20	3,523.82
Three Mile Falls quarters, west side.....	3,414.50	3,414.50
	4,083.70	32,821.17
Telephone system, west side.....	101.70	2,772.57
Total cost of construction features.....	106,201.12	2,454,355.31
Operation and maintenance added to construction.....	1485.85	18,836.15
Gross construction cost to June 30, 1919.....	106,201.12	2,473,191.46
Less revenues earned during construction period:		
Rental of buildings.....		769.00
Rental of grazing and farm lands.....		22,129.46
Rental of irrigation water.....		80.00
Contractors freight refunds.....		1,055.31
Other revenues, unclassified.....		10,288.07
Loss on hospital operations.....	163.80	1,862.48
	163.80	33,459.36
Net construction cost to June 30, 1919.....	106,037.32	2,439,732.10

¹ Deduct.² Sale of buildings, no cost during fiscal year.

Statement of cost by calendar years, Umatilla project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ended Dec. 31:			
1907.....	\$888,021.43.		\$888,021.43
1908.....	347,724.04	\$21,533.97	369,258.01
1909.....	110,049.68	27,200.00	137,249.68
1910.....	81,557.21	30,724.15	112,281.36
1911.....	134,764.17	30,538.32	165,302.49
1912.....	93,190.64	27,140.45	120,331.09
1913.....	71,021.46	32,737.93	103,759.39
1914.....	314,071.70	26,334.68	340,406.38
1915.....	319,020.11	5,380.47	324,400.58
1916.....	187,486.62	28,409.55	215,896.17
1917.....	60,286.14	42,372.43	102,658.57
1918.....	31,520.59	71,817.50	103,338.09
Jan. 1 to June 30, 1919.....	90,477.67	35,308.98	125,786.65
Subtotal.....	2,473,191.46	379,507.52	2,852,698.98
Balance in plant accounts.....		7,605.79	7,605.79
Total.....	2,473,191.46	387,113.31	2,860,304.77

Statement of cost, by fiscal years, Umatilla project.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ended June 30—			
1908.....	\$882,041.86	\$8,563.96	\$890,605.82
1909.....	128,965.20	26,484.38	155,449.58
1910.....	116,039.24	23,546.55	139,585.79
1911.....	105,631.29	33,554.23	139,185.52
1912.....	113,636.13	28,444.26	142,080.39
1913.....	88,061.26	29,822.46	117,883.72
1914.....	102,389.31	30,981.80	133,371.11
1915.....	382,946.65	6,493.40	389,440.05
1916.....	248,062.23	23,719.14	271,781.37
1917.....	171,677.45	35,560.57	207,238.02
1918.....	27,536.72	51,216.51	78,753.23
1919.....	106,201.12	78,090.24	184,291.36
Subtotal.....	2,473,191.46	379,507.52	2,852,698.98
Balance in plant accounts.....		7,605.79	7,605.79
Total.....	2,473,191.46	387,113.31	2,860,304.77

Estimated cost of contemplated work, Umatilla project, during fiscal year 1920.

Features.	Sub-feature.	Principal feature.
Examination and surveys.....		\$500
Canal system: Improvement of Canal A.....		25,000
Lateral system:		
East side, supplemental construction.....	\$12,000	
West side, construction of laterals to vested water-right lands.....	3,800	
Farm units.....		15,800
Permanent improvements.....		500
Operation and maintenance under public notice.....		1,500
Reimbursable accounts.....		47,000
Total.....		700
		91,000

294 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating cost and revenues, Umatilla project, to Dec. 31, 1918.

Features.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works.....	\$4,546.87	\$1,867.44	\$6,414.31	\$55,297.24	\$45,332.25	\$100,629.49
Canal system.....	2,345.61	3,182.51	5,528.12	6,218.04	9,483.58	15,701.62
Lateral system:						
East side.....	4,712.11	13,484.31	18,196.42	54,079.42	126,671.37	180,750.79
West side.....	2,332.59	4,319.19	6,651.78	4,363.57	7,646.39	12,009.96
	7,044.70	17,803.50	24,848.20	58,442.99	134,317.76	192,760.75
Drainage, east side.....		603.61	603.61		8,662.22	8,662.22
Sluicing, west side.....		18,271.75	18,271.75		18,271.75	18,271.75
Undistributed expenses, hydrometry, damage claims and general expenses.....	5,987.15	9,251.56	15,238.71	11,067.96	12,274.95	23,342.91
Permanent improvements.....		811.40	811.40		4,050.40	4,050.40
Subtotal.....	19,924.33	51,791.77	71,716.10	131,026.23	232,392.91	363,419.14
Less unpaid operation and maintenance charges added to construction.....			¹ 101.40			19,220.60
Total.....			71,817.50			344,198.54
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			31,763.11			155,883.35
Operation and maintenance charges paid in advance by water-right applicants.....			² 599.72			1,790.88
Operation and maintenance charges paid and forfeited by water-right applicants.....			50.70			1,741.47
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			1,107.98			2,823.60
Rental of land and buildings during operating period.....			575.50			5,074.75
Rentals of irrigation water.....			4,361.61			19,730.89
Other revenues unclassified, earned during operating period.....			525.08			2,073.63
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			² 547.52			² 1,052.18
Total.....			37,236.74			188,065.75
Difference (deficit).....			34,580.76			156,132.79

¹ Add.

² Deduct.

OREGON-CALIFORNIA, KLAMATH PROJECT.

HERBERT D. NEWELL, project manager, Klamath Falls, Oreg.

LOCATION.

Counties: Klamath, Oreg.; Siskiyou and Modoc, Calif.

Townships: 38 to 41 S., Rs. 8 to 14 E., Willamette meridian; 46 to 48 N., Rs. 1 to 8 E., Mount Diablo meridian.

Railroad: California Northeastern, Klamath Falls Municipal Railway.

Railroad stations and estimated population June 30, 1919: Klamath Falls, 5,500; Midland, 50; and Olene, Oreg., 50.

WATER SUPPLY.

Source of water supply: Upper Klamath Lake, Lost River, and Clear Lake.

Area of drainage basin: 3,700 square miles.

Annual run-off in acre-feet, 1904 to 1918: Link River at Klamath Falls (3,110, square miles)—Maximum, 2,144,200; minimum, 1,216,000; mean, 1,642,000. Lost River and Willow Creek at Clear Lake, Calif.—Maximum, 252,000; minimum, 34,700; mean, 135,000. Lost River at Olene, Oreg.—Maximum, 473,500; minimum, 128,000; mean, 263,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919, 50,000 acres.

Area under water-right applications, season of 1919, 42,673 acres.

Area under special contract, season of 1919, 6,000 acres.

Length of irrigation season: From April 15 to September 30—168 days.

Average elevation of irrigable area: 4,100 feet above sea level.

Average annual rainfall on irrigable area, 11 years: 13.4 inches.

Range of temperature on irrigable lands:—10° to 100° F.

Character of soil of irrigable area: Disintegrated basalt, volcanic ash, and diatomaceous earth, being largely classified as Yakima sandy loam.

Principal products: Alfalfa, hay, grain, and vegetables; stock, poultry, and dairy products.

Principal markets: Portland, Oreg.; Sacramento and San Francisco, Calif.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: November 18 and December 7, 1908; August 24, 1909; June 9, 1910; March 23, and September 24, 1914; March 26 and September 15, 1915; March 9 and 16, 1916; February 12, March 9 and 31, 1917; March 13, 1918.

Location of lands opened: T. 38 S., R. 9 E.; 39 S., Rs. 8 to 11½ E.; 40 S., Rs. 9 to 11 E.; 41 S., Rs. 10 to 12 E., Willamette meridian, and 48 N., R. 5 E., Mount Diablo meridian.

Limit of area of farm units: 160 acres.

Duty of water, 1.8 acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land, \$30 for the first and second units, \$39 and \$45 for the third unit.

Annual operation and maintenance charge, season of 1919, minimum charge \$1.25 per acre for 2 acre-feet, 40 cents for first additional acre-foot, and 60 cents per acre-foot thereafter.

CHRONOLOGICAL SUMMARY.

Reconnaissance made in October and November, 1903.

Preliminary surveys begun in 1904.

Construction recommended by a board of engineers May 1, 1905.

Construction authorized by Secretary May 15, 1905.

Main canal completed August, 1907.

First irrigation by Reclamation Service season of 1907.

Keno Canal completed October, 1908.

South Branch Canal completed March, 1909.

Clear Lake Dam completed January, 1910.

Lost River Diversion Dam completed June, 1912.

Adams Canal enlargement begun October, 1913, completed April, 1914.

Second unit lateral system begun October, 1912, completed June, 1915.

G Canal (enlargement of Griffith Lateral), begun March 8, 1915, completed April, 30, 1915.

Lateral, margin of Tule Lake, begun June 5, 1916, completed June 30, 1917.

Entire project 76 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Klamath project provides for storage of water in the natural reservoir of Upper Klamath Lake, lying just north of Klamath Falls, Oreg., and in the Clear Lake Reservoir, Calif., at the head of Lost River and 6 miles east of Tule Lake. Water for irrigation is diverted from the east side of Link River the outlet of Upper Klamath Lake, 700 feet from the lake, into the Main (A) Canal, which extends 9 miles in a southeasterly direction, supplying canals and laterals in the first unit of the project, and a portion of the second unit in Poe Valley and on Nuss Lateral. The water diverted from Lost River into the Griffith (G) Canal at the Lost River Dam, 10 miles southeast from Klamath Falls, Oreg., supplies the lands under that canal in the second unit and also the Adams Canal, which covers the portion of the first unit east of Lost River, the lands on the margin of Tule Lake in private ownership, and a portion of the bed of Tule Lake in public ownership.

The United States claims all waste, seepage, unappropriated spring and percolating water arising within the project, and proposes to use such water in connection therewith.

Clear Lake Dam and dikes were built mainly to withhold the waters of Lost River from Tule Lake, into which that river empties. The water stored in the Clear Lake Reservoir will be released into Lost River whenever needed for irrigation. Tule Lake has no visible outlet, and it is proposed to reclaim about 30,000 acres of the lake bed by evaporation. To assist in this, the Lost River Diversion Dam and channel (8 miles long) were built to divert the flood waters of Lost River into Klamath River.

The present irrigation system consists of 232.4 miles of canals and laterals, 83.9 miles of open drains, and 8 miles of closed drains. These works cover 29,281 acres of irrigable land in the first unit, 7,459 acres of irrigable land in the second unit, and 5,933 acres of irrigable land in the third unit; also about 1,327 acres of irrigable land in public ownership in the former bed of Tule Lake, not yet under public notice, and 6,000 acres of district land under special contract, a total irrigable area of 50,000 acres.

As the reclamation of the bed of Tule Lake progresses a second diversion dam will be built in Lost River about 15 miles nearly south from the first dam. This will divert water east and west on the reclaimed area of the lake bed.

A canal known as the Keno Power Canal was built on the west bank of Link River in Klamath Falls, Oreg., diverting water from the river 1,200 feet from its outlet from Upper Klamath Lake. This canal, primarily designed for power purposes, was also planned to furnish water for irrigating lands on the west side of Klamath River, southwest from Klamath Falls, Oreg. No power plant, however, has been installed by the Government, as all irrigation at present is by gravity flow. This power canal has been leased to the California-Oregon Power Co. for 10 years with privilege of renewal, at a rental of \$1,000 per annum and the further consideration of rates for power for pumping for irrigation within the project of 0.7 cents per kilowatt hour for units of 100 horsepower or over.

An undeveloped power site is located at the drop from the Main (A) Canal into the South Branch (C) Canal, 9 miles southeast from Klamath Falls, Oreg.

The principal features of the project are the Clear Lake Reservoir, the Lost River diversion works, the Keno Power Canal, the Main Canal Tunnel, 3,300 feet long, and the main canals of the distributing system.

SUMMARY OF GENERAL DATA FOR KLAMATH PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete	141,444
Public land entered to June 30, 1919	2,691
Public land open to entry on June 30, 1919	59
Public land withdrawn on June 30, 1919	27,300
Private land June 30, 1919	111,394
Acreage service could have supplied in season of 1918	50,000
Estimated acreage service can supply in season 1919	50,000
Estimated acreage service can supply in season 1920	57,000
Acreage irrigated season of 1918	33,268
Acreage cropped under irrigation season of 1918	32,127

Crops:	
Value of irrigated crops season of 1918	\$929, 131. 00
Value of irrigated crops per acre cropped	\$28. 92
Finances:	
Net construction cost to June 30, 1919	\$3, 031, 341. 19
Per cent completed on June 30, 1919	76
Appropriated for fiscal year 1920	\$357, 000. 00
Estimated per cent complete by June 30, 1920	86
Proposed appropriation for fiscal year 1921	\$289, 000
Estimated per cent complete by June 30, 1921	94
Announced construction charges per acre	\$30, \$39, \$45
<hr/>	
Appropriation fiscal year 1919	\$423, 000. 00
Decrease under 10 per cent provision	¹ 22, 200. 00
Increase miscellaneous collections and transfers	24, 614. 03
Increased compensation	5, 415. 65
	\$430, 829. 68
<hr/>	
Expenditures chargeable to 1919 appropriation—	
Disbursements	107, 778. 84
Transfers	8, 346. 17
Current liabilities	9, 048. 94
Contingent liabilities	388. 72
	125, 562. 67
<hr/>	
Unencumbered balance on July 1, 1919	305, 267. 01
<hr/>	
Repayments:	
Value of construction water-right contracts	1, 749, 217. 08
<hr/>	
Construction charges—	
Accrued to June 30, 1919	¹ 395, 059. 89
Collected to June 30, 1919	373, 610. 07
<hr/>	
Uncollected on June 30, 1919	21, 449. 82
<hr/>	
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919	² 267, 069. 60
Collected to June 30, 1919	³ 246, 666. 72
Uncollected on June 30, 1919	⁴ 20, 402. 88
<hr/>	
Water rental charges—	
Accrued to June 30, 1919	38, 372. 75
Collected to June 30, 1919	38, 372. 75
<hr/>	
Power charges—	
Accrued to June 30, 1919	3, 020. 00
Collected to June 30, 1919	3, 020. 00
<hr/>	
Drainage:	
Estimated acreage damaged by seepage to June 30, 1919	6, 200
Miles of drains built to June 30, 1919—	
Open	83. 9
Closed	8. 0
	91. 9
Estimated acreage protected by drains to June 30, 1919	23, 400
Estimated acreage to be protected by authorized system	25, 600
Cost of drainage works to June 30, 1919	\$425, 934. 69

CONSTRUCTION DURING FISCAL YEAR.

The work done during the fiscal year consists of a small amount of lateral construction and the installation of minor structures.

¹ Deduct.² Includes supplemental construction accrued as operation and maintenance, \$1,077.43.³ Includes supplemental construction paid as operation and maintenance, \$546.53.⁴ Includes supplemental construction to be paid as operation and maintenance uncollected, \$520.00.

SEEPAGE AND DRAINAGE.

Two drag-line machines were operated from July 1 to November 1; from the latter date to the end of the fiscal year, three machines were being operated except for a period of about two months during the winter, when all drainage work was stopped on account of cold weather. The drainage works constructed during the fiscal year consist of 12 miles of open drains, 4.7 miles of which were enlargements of existing drains. The above work required the excavation of 203,580 cubic yards of material, approximately one-half of which required blasting.

The construction of drainage works, on the first unit, was authorized by public notice of September 15, 1915, which provided for an increase in the construction charges of \$12.50 per acre. The area of the first unit, exclusive of vested water-right lands, is about 27,560 acres. The works constructed and in progress will be approximately equal to the amount provided for in the above public notice. The work in progress will be completed in about two months. The drains constructed and in progress will protect an area of about 24,500 acres. After completion of the drainage works authorized, there will remain an area of about 2,910 acres which will have no drainage protection. The latter area is fairly well scattered over the project, and parts of it are threatened with damage from seepage.

A contract has been entered into with the owners of the Ankeny tract for the construction of drainage works. The Ankeny tract comprises an area of 950 acres of vested water-right land which is included in the first unit. The service has agreed to construct drainage works to the extent of \$20 per acre. Work was begun on the Ankeny tract on June 23.

BOARD MEETINGS.

Date.	Subject.	Personnel.
1919.		
Jan. 23	Appraisal of Ankeny Canal.....	D. C. Henney, G. W. Offield, R. E. Smith.
Jan. 24	Charges to land irrigable by pumping from project canals.	D. C. Henney, J. B. Bond, Herbert D. Newell.
Apr. 19	Sale of Ankeny Canal, disposition of credits if sale is made.	Herbert D. Newell, A. H. Gullickson.

OPERATION AND MAINTENANCE.

During the latter part of the season of 1918 several breaks occurred on project canals. All of the breaks were serious, but were quickly repaired, water deliveries being interrupted only a few hours. The run-off from the streams supplying the project was very light as compared with former years, but was sufficient for project requirements.

In July, 1918, strong southeast winds occurred several times during which the water in the Upper Klamath Lake was blown away from the headworks of the main canal. The head in the main canal would be cut down until the storm subsided, usually about 12 hours. When the above condition prevailed Link River and the Keno Canal were entirely dry.

The maintenance work consisted of the usual cleaning of canals and laterals. Repairs were also made to the timber-lined sections of the C canal.

The spring of 1919 was much colder than usual, late frosts occurring in May and June, causing considerable damage to farm crops. Water was turned into the main canal on April 18 for the purpose of priming the canals; no water was delivered until May. During May and June an exceptionally heavy demand for water prevailed and all canals were being operated to their maximum capacity.

On June 21, 1919, the main truss supporting the Olene flume across Lost River collapsed, taking with it 96 feet of flume. The work of replacing the flume was begun immediately and water deliveries were resumed on July 8. The Olene flume supplies second unit lands in the South Poe Valley and Nuss Lake districts, the total irrigable area being about 4,200 acres, of which approximately 60 per cent is in cultivation. With the exception of several gardens and small portions of a few grain fields, no damage was caused to crops by reason of the interruption in service.

Historical review, Klamath project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water.....	35,480	38,000	40,000	44,000	50,000	50,000
Acreage irrigated.....	24,400	27,254	29,351	33,635	33,268	.....
Miles of canal operated.....	178	187	216	216	210	.....
Water diverted (acre-feet).....	56,750	68,830	66,010	65,368	104,926	.....
Water delivered to land (acre-feet).....	25,610	30,640	29,970	32,780	52,090	.....
Per acre of land irrigated (acre-feet).....	1.06	1.125	1.02	0.975	1.36	.....

SETTLEMENT.

On June 30, 1919, only two farm units remained unentered. All the entrymen have improved their holdings and the greater portion of the entered lands are in crops.

The demand for good farm land has been brisk and a number of holdings have changed hands at prices varying from \$75 to \$110 per acre. At Klamath Falls and Malin flour mills have been erected and placed in operation. In general the farmers are prosperous, as good prices have been received for all farm products.

In 1917 construction was begun on a railroad from Klamath Falls to Dairy, about 20 miles to the east. This line was projected to connect with the Oregon Short Line in the eastern part of the State. The road is nearing completion and the prospects seem bright for the early extension of this line.

Good progress has been made in the reclamation of Tule Lake. Approximately 16,000 acres have been uncovered, of which 5,900 acres have been placed in the third unit. Pending the construction of irrigation works for the Tule Lake lands below the third unit, the lands have been leased in tracts of about 80 acres for periods of one year. No water for irrigation has been available for the above tracts, except for a few which are located close to project laterals. The prices bid for the above tracts have ranged from 50 cents to \$6 per acre, the higher prices usually being for the lands more recently uncovered.

Settlement data, Klamath project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Total number of farms on project.....	373	391	409	537	560	570
Population.....	1,375	1,520	1,580	1,610	1,800	2,000
Number of irrigated farms.....	333	352	409	527	530	540
Operated by owners or managers.....	290	247	267	336	340	350
Operated by tenants.....	83	195	132	191	190	190
Population.....	1,300	1,426	1,486	1,480	1,510	1,600
Number of towns.....	4	4	4	4	4	4
Population.....	4,500	4,700	5,000	5,050	6,000	6,500
Total population towns and on farms.....	5,875	6,220	6,580	7,260	7,800	8,600
Number of public schools.....	18	19	20	20	20	20
Number of churches.....	9	9	9	9	10	10
Number of banks.....	3	3	3	3	4	4
Total capital stock.....	\$175,000	\$175,000	\$175,000	\$175,000	\$225,000	\$225,000
Amount of deposits.....	\$1,000,000	\$1,118,500	\$1,219,846	\$1,390,000	\$2,383,000	\$2,500,000
Number of depositors.....	2,600	3,565	4,281	5,310	6,264	6,500

¹ Estimated.**CROPS.**

Alfalfa continues to be the principal crop of this project; the yield per acre for 1918 was somewhat below that of 1917, but the prices prevailing in 1918 were considerably greater than of 1917.

During May and June, 1919, there were several periods of low temperature which caused considerable damage. Of the field crops, alfalfa suffered most, the greater damage usually occurring on fields which had not been recently irrigated. Most of the farmers clipped their alfalfa after the June frosts. Since the frosts, the weather has been very dry and warm and it is probable that the alfalfa crop will be up to normal.

The crop report of the Klamath project is restricted to the area covered by the usual crop census of the Reclamation Service, and does not include the Van Brimmer irrigation district and several pumping units which receive their water supply from project canals.

Crop report Klamath project, Oregon-California, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	11,454	Ton.....	31,605	2.76	\$20.00	\$632,100	\$55.20
Barley.....	3,191	Bushel.....	44,413	13.90	1.15	51,075	16.00
Fruit.....	35					25	.72
Garden.....	165					6,691	40.50
Hav.....	2,519	Ton.....	2,691	1.03	20.00	52,020	20.70
Oats.....	2,538	Bushel.....	46,716	18.40	.96	44,847	17.70
Pasture.....	8,130	Acre.....			5.00	40,650	5.00
Potatoes.....	179	Bushel.....	19,318	108.00	1.19	21,259	118.70
Rye.....	449	do.....	3,349	7.5	1.62	5,425	12.10
Wheat.....	3,480	do.....	38,317	11.1	1.95	74,718	21.60
Sugar beets.....	7	Ton.....	55	7.3	6.00	330	44.00
Total cropped acreage.....	32,127	Total and average.....				923,131	28.92
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop.....	1,141	Total irrigated area farms reported.			33,288	474	.....
Total irrigated acreage.....	33,268	Total cropped area farms reported.			32,127	404	.....

FINANCIAL STATEMENT.

Project balance sheet, Klamath project, June 30, 1919.

Cash.....		\$50.00
Inventory of stock on hand.....		28,166.33
Unfulfilled orders.....		388.72
Currents accounts:		
Unsecured water right.....	\$42,714.55	
Construction charge.....	1,353,079.76	
Accounts receivable.....		1,395,794.31
Gross construction cost.....	\$3,072,101.52	
Less cost adjustments and revenue earnings.....	60,760.33	
Net construction cost.....		3,081,341.19
Operation and maintenance cost.....	\$74,855.30	
Less revenue earnings.....	8,139.66	
		296,716.24
Accounts payable.....		10,190.61
Contingent obligations.....		438.72
Collections and contracts of specific amounts for repayments to reclamation fund.....		2,036,426.72
Capital investment:		
Disbursement transfer and joint construction vouchers received.....	\$3,461,407.47	
Collection, transfer, refund, and joint construction vouchers issued.....	756,006.73	
Net investment.....		2,706,400.74

Feature costs of Klamath project to June 30, 1919.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys: Project as a whole.....	\$9,398.34	\$137,362.92
Storage works:		
Clear Lake Dam and dikes.....	175.00	332,279.88
Horsefly Reservoir site.....		670.49
	175.00	332,950.37
Canal system:		
Main canal.....		696,948.88
East Branch canal.....		49,670.32
South Branch canal.....		136,485.09
Adams & Carr canals.....		182,394.57
Lost River diversion channel.....		306,312.69
Griffith Canal enlargement.....		89,770.17
Ankeny Canal.....		57,090.00
Lantell Valley canals.....		9,834.23
J canal.....		812.62
J canal headworks.....		220.06
South Branch cut-off.....		265.82
Supplemental construction, first unit.....		1,659.11
		1,583,693.58
Lateral system:		
First unit.....		150,820.54
Second unit.....	111.12	114,498.51
Third unit.....	2,634.22	44,029.30
Supplemental construction, first unit.....	1320.54	20,854.09
	2,424.60	330,200.44
Drainage system:		
First unit.....		112,282.89
Second unit.....		487.74
Lantell Valley.....		128.16
Lower Klamath Lake.....		9,147.28
Pumping units.....		2,650.02
Tule Lake.....	118,018.74	13,013.74
Supplemental construction, first unit.....	44,488.01	287,974.86
	57,801.75	425,684.60
Power system:		
Keno canal.....		111,329.02
South Branch power plant.....		740.10
McCormick tract.....		11,424.62
Leavitt tract.....		3,415.38
		126,809.12

¹ Deduct.

² Transfer of cost incurred during fiscal year 1918 from supplemental to original construction.

Feature costs of Klamath project to June 30, 1919—Continued.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Farm units:		
Second unit.....		\$2,609.15
Third unit.....		1,640.19
Marginal lands, below third unit.....	\$287.54	622.41
	287.54	4,871.75
Permanent improvements: Headquarters.....		20,043.72
Telephone system: Project as a whole.....		26,185.87
Operation and maintenance during construction (water-rental basis).....	23,945.58	65,866.88
Operation and maintenance charges transferred to and compounded with construction charges.....	2,160.45	3,712.03
Total cost of construction features.....	105,643.26	8,057,731.37
Balance in plant accounts.....		31,794.15
Balance in unadjusted clearing accounts.....		2,576.00
Gross construction cost to June 30, 1919.....		3,092,101.52
Less revenues earned during construction:		
Rentals of buildings.....		144.50
Rentals of grazing and farming lands.....	106.44	17,342.03
Rentals of irrigation water.....		31,821.45
Contractors freight refunds.....	586.64	9,142.35
Other revenues, unclassified.....	1.66	902.05
Profit on hospital operations.....	280.40	1,407.95
	759.94	60,760.33
Net cost of construction of project to June 30, 1919.....	104,883.32	3,031,341.19

¹ Includes \$32,520.19 transfer of operations and maintenance costs for years 1907 and 1908 to operation and maintenance during construction.

² Deduct.

Statement of cost by calendar years, Klamath project.

Year ending Dec. 31—	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1904.....	\$11,498.31				\$11,498.31
1905.....	65,987.53				65,987.53
1906.....	531,011.27				531,011.27
1907.....	675,762.74				675,762.74
1908.....	274,708.96		\$32,520.19	\$32,520.19	307,229.15
1909.....	246,820.94		21,735.08	21,735.08	268,556.02
1910.....	96,939.10		20,000.49	20,000.49	116,939.59
1911.....	261,951.81		20,981.02	20,981.02	282,932.83
1912.....	85,609.17		21,318.18	21,318.18	106,927.35
1913.....	143,894.77		30,479.31	30,479.31	174,374.08
1914.....	187,552.99		31,898.26	31,898.26	219,451.25
1915.....	132,673.79	\$21,863.40	\$3,790.54	58,653.94	191,327.73
1916.....	133,951.49	7,338.52	\$13,635.90	20,974.42	160,925.91
1917.....	100,415.35	1,145.26	48,447.03	49,592.29	150,007.64
1918.....	101,683.55	2,554.54	28,524.97	31,079.51	132,763.06
Jan. 1 to June 30, 1919.....	35,402.72	\$32,965.16	\$1,475.67	31,480.49	66,892.21
Subtotal.....	2,991,864.49	65,866.88	304,855.30	370,722.18	3,362,586.67
Balance in plant accounts.....	31,794.15				31,794.15
Unadjusted clearing accounts.....	2,576.00				2,576.00
Total to June 30, 1919.....	3,026,234.64	65,866.88	304,855.30	370,722.18	3,396,956.82

¹ Actual cost for year \$20,089.92 account of including \$12,430.27 cost for 1907. Total transferred to "Operation and maintenance during construction."

² Actual cost for year \$12,251.77 account of including \$9,611.63 cost for 1914.

³ Actual cost for year \$26,584.14 account of adjustment of \$10,206.14 in 1916.

⁴ Actual cost for year \$23,842.30. See note under 5.

⁵ Actual cost for period \$444.97 account of including \$12,430.27 cost for 1907, also \$20,089.92 cost for 1906.

⁶ Deduct credit caused by transfer of cost incurred in previous years to "Operation and maintenance during construction."

Statement of cost by fiscal years, Klamath project.

Year ending June 30-	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
1905.....	\$34,559.30				\$34,559.30
1906.....	172,254.23				172,254.23
1907.....	827,030.70				827,030.70
1908.....	302,201.46		\$18,767.01	\$18,767.01	320,968.47
1909.....	319,322.32		23,560.28	23,560.28	342,882.60
1910.....	196,619.44		21,999.76	21,999.76	217,619.20
1911.....	119,672.90		23,107.90	23,107.90	142,680.80
1912.....	221,140.67		15,744.61	15,744.61	236,885.28
1913.....	132,068.25		24,024.51	24,024.51	156,092.76
1914.....	107,320.76		34,010.03	34,010.03	141,330.79
1915.....	154,789.10	\$12,906.08	39,312.81	52,218.89	207,007.99
1916.....	106,912.43	11,927.27	18,275.44	30,202.71	137,115.14
1917.....	108,457.37	5,513.83	29,579.92	35,093.75	143,551.12
1918.....	118,917.88	1,574.12	36,643.74	38,217.86	157,135.74
1919.....	71,097.68	33,945.58	19,829.29	53,774.87	125,472.55
Subtotal.....	2,991,864.49	65,866.88	304,855.30	370,722.18	3,362,586.67
Balance in plant accounts.....	31,794.15				31,794.15
Unadjusted clearing accounts.....	2,576.00				2,576.00
Total.....	3,026,234.64	65,866.88	304,855.30	370,722.18	3,396,956.82

NOTE.—See explanatory notes on table of costs by calendar year.

Estimated cost of contemplated work, Klamath project, during fiscal year 1920.

Features.	Subfeature.	Principal feature.
Examination and surveys.....		\$4,000
Canal system:		
Concrete lining.....	\$40,000	
Construction C-G cut-off.....	75,000	115,000
Lateral system.....		5,000
Drainage system:		
Ankeny lands.....	19,000	
First unit.....	13,000	
Operation and maintenance, water rentals.....		32,000
Operation and maintenance, public notice.....		2,000
Reimbursable accounts.....		54,000
Total.....		2,000
		214,000

304 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Operating costs and revenues, Klamath project, to Dec. 31, 1918.

Feature.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Canal system: First, second, and third units.	\$11,579.51	\$10,721.53	\$22,301.04	\$49,078.86	\$61,728.41	\$110,807.27
Lateral system: First, second, and third units.	8,564.11	14,766.75	23,330.86	50,542.50	134,818.00	185,360.50
Drainage system: First unit, open drains.		485.39	485.39		1,421.25	1,421.25
Flood protection: First unit.					10,792.63	10,792.63
Total.	20,143.62	25,973.67	46,117.29	99,621.36	208,261.19	307,882.55
Less accrued and unpaid operation and maintenance charges transferred to and added to construction charges.			1281.63			1,551.58
Total.			45,835.66			306,330.97
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.			57,917.87			265,992.17
Operation and maintenance charges paid in advance by water-right applicants.			142.21			161.21
Operation and maintenance charges paid and forfeited by water-right applicants.						3.75
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.			374.67			944.48
Rental of land and buildings during operating period.			623.10			1,315.10
Rentals of irrigation water.			1,127.50			5,476.59
Other revenues, unclassified, earned during operating period.						38.71
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.			913.05			3,008.05
Total.			58,987.88			270,823.96
Difference:						
Gain for calendar year 1918.			13,152.22			
Deficit to end of calendar year.						35,507.01

¹ Deduct.

² Credit of \$11.52 account of 1918 accruals taken into accounts in February, 1919.

³ Deduct.

NOTE.—Included in the deficit to end of calendar year 1918 is an item of \$32,520.19, representing operation and maintenance charges for the years 1907 and 1908, which will be transferred to operation and maintenance during construction in 1919. It also includes an item of \$2,160.45, representing operation and maintenance accruals transferred to and added to construction charges in 1919, thus making net deficit to Dec. 31, 1918, only \$326.37.

SOUTH DAKOTA, BELLE FOURCHE PROJECT.

B. E. HAYDEN, project manager, Newell, S. Dak.

LOCATION.

Counties: Butte and Meade.

Townships: 6 to 10 N., Rs. 3 to 8 E., Black Hills meridian.

Railroads: Chicago & North Western; Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul.

Railroad stations and estimated population June 30, 1919: Belle Fourche, 1,450; Newell, 400; Nisland, 200; Fruitdale, 75; Vale, 75.

WATER SUPPLY.

Source of water supply: Belle Fourche River.

Area of drainage basin: 4,265 square miles.

Annual run-off in acre-feet: Belle Fourche River at diversion dam (4,265 square miles), 1903 to 1918—maximum, 554,600; minimum, 119,800; mean, 308,180.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: 82,592 acres.

Area under water-right applications, season of 1919: 71,694 acres.

Length of irrigation season: May 1 to October 1—152 days.

Average elevation of irrigable area: 2,800 feet above sea level.

Rainfall on irrigable area: 10 years, average, 14.73 inches; 1918, 17.56 inches.

Range of temperature on irrigable area: -38° to 103° F.

Character of soil of irrigable area: North side of Belle Fourche River principally heavy clay soil, with scattered areas of sandy clay loam; south side, sandy loam. All of the soils are heavy enough not to be disturbed by winds.

Principal products: Grain, corn, alfalfa, potatoes, garden truck, and sugar beets.

Principal markets: Omaha, Nebr.; Chicago, Ill.; and mining towns in the Black Hills.

LANDS OPENED FOR IRRIGATION.

Dates of public notices, regulations, and orders relating thereto: June 21, 1907; May 29, 1908; January 18, 1909; February 19, November 26, 1910; January 24, March 9, May 4, December 30, 1911; February 3, May 2, 1912; February 26, June 23, July 21, 1913; January 19, February 26, May 29, August 14, September 24, 1914; April 10, May 18, 1915; March 10, March 16, July 6, 1916; January 9, February 10, October 4, 1917; April 10, 1918; March 8, April 28, 1919.

Location: Tps. 7 to 10 N., Rs. 2 to 7 E.

Limit of area of farm units: Public, 80 acres; private, 160 acres.

Duty of water: 1.5 acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land: \$30, \$35, \$40, and \$45.

Annual operation and maintenance charge: For 1918, \$1 per acre-foot for water used in July and August, and 50 cents per acre-foot for all other water used, with a minimum rate of \$1.25 per acre. For 1919, same plan except that rates are raised to \$1.20, 60 cents, and \$1.50, respectively.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1903.

Construction recommended by board of engineers April 29, 1904.

Construction authorized by Secretary May 10, 1904.

Diversion dam and inlet canal completed September, 1907.

Belle Fourche Dam completed June, 1911.

First irrigation, season of 1908.

Entire project 84 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Belle Fourche project provides for the diversion of water from the Belle Fourche River by means of a dam about 1½ miles below Belle Fourche, S. Dak., and an inlet or supply canal about 6½ miles in length into a storage reservoir controlled by the Belle Fourche Dam on Owl Creek, a tributary of the Belle Fourche River; the distribution of water from the inlet canal to a small area of land and the distribution of water from the reservoir through two canal systems to lands on both sides of the Belle Fourche River.

The United States claims all waste, seepage, unappropriated spring, and percolating waters arising within the project, and proposes to use such water in connection therewith.

The features of the above irrigation plan completed are the diversion dam, head-works, inlet canal, Belle Fourche storage dam, south canal and laterals, north canal and all tributary laterals and structures. The features not yet constructed are Willow Creek and Nine Mile laterals and their tributaries, covering approximately 15,000 acres of land.

SUMMARY OF GENERAL DATA FOR BELLE FOURCHE PROJECT TO
END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	97, 889
Public land entered to June 30, 1919.....	36, 992
Public land open to entry on June 30, 1919.....	882
Public land withdrawn on June 30, 1919.....	15, 300
State land unsold June 30, 1919.....	315
Private land June 30, 1919.....	44, 400
Acreage service could have supplied in season of 1918.....	82, 592
Estimated acreage service can supply in season 1919.....	82, 592
Estimated acreage service can supply in season 1920.....	82, 592
Acreage irrigated, season of 1918.....	52, 445
Acreage cropped under irrigation, season of 1918.....	52, 445
Acreage dry farmed, season of 1918.....	800

Crops:

Value of irrigated crops, season of 1918.....	\$1, 276, 115. 00
Value of irrigated crops per acre cropped.....	24. 36
Value of dry-farmed crops, season of 1918.....	8, 000. 00
Value of dry-farmed crops per acre cropped.....	10. 00

Finances:

Net construction cost to June 30, 1919.....	\$3, 463, 266. 97
Per cent completed on June 30, 1919.....	84
Appropriated for fiscal year 1920.....	\$141, 000
Estimated per cent complete by June 30, 1920.....	84
Proposed appropriation for fiscal year 1921.....	\$120, 000
Estimated per cent complete by June 30, 1921.....	85. 3
Announced construction charges per acre.....	\$30, \$35, \$40, and \$45
Appropriation, fiscal year 1919.....	\$262, 000. 00
Miscellaneous collections and transfers.....	7, 770. 31
Increased compensation.....	4, 568. 51
	<u>\$274, 338. 82</u>

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$75, 450. 81
Transfers.....	276. 18
Current liabilities.....	10, 430. 54
Contingent liabilities.....	60. 00
	<u>86, 217. 53</u>

Unencumbered balance on July 1, 1919.....	<u>188, 121. 29</u>
---	---------------------

Repayments:

Value of construction water-right contracts.....	\$2,394,007.00
Construction charges—	
Accrued to June 30, 1919.....	331,076.91
Collected to June 30, 1919.....	313,257.38
Uncollected on June 30, 1919.....	17,819.53
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	374,855.24
Collected to June 30, 1919.....	325,842.90
Uncollected on June 30, 1919.....	49,012.34
Water-rental charges—	
Accrued to June 30, 1919.....	3,088.44
Collected to June 30, 1919.....	2,938.44
Uncollected on June 30, 1919.....	150.00

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	2,800
Cost of drainage works to June 30, 1919 (investigations).....	\$3,344.27

CONSTRUCTION DURING THE FISCAL YEAR.

The project was not extended during the fiscal year except that about 1 mile of small lateral was built to include 147 acres of high land along the north canal. This work was not completed on June 30.

Two small four-room cottages were built in Newell for housing Government employees. The cost was \$5,235.

Adjudication surveys covering the Redwater canal system were made during the year and investigations made and data secured to determine the feasibility of the proposed Chicken Creek Reservoir.

SEEPAGE AND DRAINAGE.

It is estimated that the seeped area of the project increased about 150 acres during the year. There seems to be no disposition on the part of the water users to take steps to correct this condition.

A contract was let under supplemental construction on March 29, 1919, for the construction of approximately 5,000 feet of surface drain to take care of waste and storm waters in the Deer Creek district about 4 miles northeast of Newell. The work had not been commenced at the close of the fiscal year.

OPERATION AND MAINTENANCE.

The water supply for the season of 1918 was adequate for all lands under the project. The total flow of the Belle Fourche River for the year was 252,804 acre-feet. Storage at the end of the season amounted to 128,750 acre-feet.

The number of farms furnished with water was 906, comprising an irrigable area of 70,651 acres, of which 52,445 acres were irrigated; 51,731 acre-feet of water were delivered to farms, the duty of water being 0.99 acre-foot per acre.

Service on the south canal was interrupted from June 28 to July 8, 1918, and again on September 16, at which time the canal was closed down for the season. The trouble was caused by the slipping away

of the earth embankment supporting the lined section of the canal. The damage to crops resulting from these interruptions was light, due to the more than usual amount of precipitation at that time of year.

Following an extremely dry winter and spring the irrigation season of 1919 commenced on May 15 and from that date until June 30 the canals were running at near capacity for the greater part of the time. Many crops were irrigated up and an abundance of water is being required. The season was started with the reservoir full and an ample supply is assured for all lands furnished from the reservoir. By June 5 the flow in the Belle Fourche River available for the Johnson lateral and inlet canal had dropped to 18 second-feet, and from that date to June 30 there was little more than sufficient water for the irrigation of gardens. Crops in this section were materially damaged.

Besides the usual routine of maintenance work, extensive repairs were made on the south canal at the concrete-lined section, and two wooden chutes totaling 800 feet in length on the Richards lateral were replaced by concrete structures. On the north canal a concrete check was installed below the Kapelski lateral.

Historical review, Belle Fourche project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Acreage for which service was prepared to supply water.....	68,852	78,591	78,591	83,335	82,592	82,592
Acreage irrigated.....	37,454	44,067	48,468	51,000	52,445	60,000
Miles of canal operated.....	498	528	529	612	612	613
Water diverted (acre-feet).....	145,284	135,804	58,395	171,749	190,844	.....
Water delivered to farms (acre-feet).....	54,232	16,484	39,133	61,134	51,731	.....
Per acre of land irrigated (acre-feet).....	1.46	0.37	0.81	1.21	0.99	.....

¹ To June 30, 1919, estimated.

SETTLEMENT AND DEVELOPMENT.

No new units were opened to settlement during the year. The development of units already opened was satisfactory and the results gratifying. Twenty-one new filings were made and there remain only ten unentered farm units on the project.

The commissioner of State school and public lands held an auction sale of school lands within the project on April 2, 1919, at which 2,124 acres of irrigable land were sold. The highest price paid was \$69 per acre, and the price paid in general was about 300 per cent higher than at the sale one year previous. Nearly all of these lands are now being farmed. There is now practically no unsold school land within the project.

A large area of native sod was broken and planted to crop during the year and old acreages continue to be farmed. There have been quite a few sales of real estate, and, generally speaking, farm values have increased from 50 to 100 per cent.

Settlement data, Belle Fourche project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project.....	1,292	1,292	1,292	1,292	1,292
Population.....	2,375	2,375	2,400	2,675	2,700
Number of irrigated farms.....	717	744	813	906	906
Operated by owners.....	493	495	543	590	590
Operated by tenants.....	224	249	260	316	316
Population.....	1,877	2,067	2,150	2,424	2,489
Number of towns.....	5	5	5	5	5
Population.....	2,050	1,775	1,845	2,100	2,200
Total population in towns and on farms.....	4,425	4,150	4,245	4,775	4,900
Number of public schools.....	23	23	23	24	24
Number of churches.....	11	11	11	11	11
Number of banks.....	9	9	9	9	9
Total capital stock.....	\$140,000	\$140,000	\$140,000		
Amount of deposits.....	\$1,145,731	\$1,464,305	\$2,206,193	\$2,391,262	
Number of depositors.....	3,728	4,228			

PRINCIPAL CROPS.

Alfalfa and wheat are the two principal crops on the project, although barley, corn, potatoes, and sugar beets are crops of considerable importance. In 1918 there were 20,467 acres of alfalfa and 9,563 acres of wheat on the project. The average values per acre for these crops were \$24.72 and \$29.83, respectively.

The total area cropped in 1919 is about 60,000 acres. Of this area there are approximately 25,000 acres in alfalfa and 12,000 acres in wheat.

Crop report, Belle Fourche project, South Dakota, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	20,467	Ton.....	42,032	2.06	\$12.00	\$504,384	\$24.72
Alfalfa seed.....	342	Bushel.....	362	1.06	9.00	3,258	9.54
Barley.....	1,636	do.....	40,775	24.90	1.00	40,775	24.90
Beans.....	146	do.....	1,551	10.69	4.20	6,556	44.90
Beets, sugar.....	1,087	Ton.....	10,603	9.77	9.00	95,427	87.93
Corn.....	2,068	Bushel.....	43,830	21.2	1.40	61,332	29.68
Corn fodder.....	848	Ton.....	1,884	2.12	8.00	15,072	16.96
Garden.....	421	.....	.....	.....	.....	17,618	41.90
Hay, native.....	3,209	Ton.....	3,610	1.12	18.00	64,980	20.16
Oats.....	4,381	Bushel.....	137,066	31.7	.70	95,946	22.19
Pasture.....	8,894	.....	.....	.....	.....	51,879	5.84
Potatoes.....	227	Bushel.....	23,380	103	.90	21,042	92.70
Rye.....	108	do.....	1,504	13.92	1.25	1,880	17.40
Wheat.....	9,563	do.....	152,674	15.7	1.90	290,080	29.83
Miscellaneous.....	312	.....	.....	.....	.....	5,856	18.75
Less duplicated areas.....	1,214	.....	.....	.....	.....	.....	.....
Total cropped acreage.....	52,445	Total and average.....				1,276,115	24.36
		Areas.	Acres.	Farms.	Per cent of project.¹		
		Irrigable area farms reported.....	70,651	906	72.1		
		Irrigated area farms reported.....	52,445	906	51.4		
		Under water-right applications.....	52,310	905	51.4		
		Under rental contracts.....	135	1	.....	
Total irrigated.....	52,445	Cropped area farms reported.....	52,445	906	51.4		

¹ Based on 97,916 acres.

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, MARCH 8, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is made as follows: The minimum annual operation and maintenance charge for the irrigation season of 1919, and thereafter until further notice, against all lands of the Belle Fourche project, South Dakota, under public notice, shall be \$1.50 per irrigable acre whether water is used thereon or not. During the months of July and August water will be furnished for \$1.20 per acre-foot, and during the balance of the irrigation season for 60 cents per acre-foot. Payments under the minimum charge will be credited on the account for water received under the above acre-foot rates. All operation and maintenance charges under the project will be payable on March 1 of each year for the preceding irrigation season, but where water-right application is made after June 15 for public land and after August 1 for private and State lands, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

2. **Repairs on Belle Fourche Reservoir.**—The operation and maintenance charges to cover repairs on Belle Fourche Reservoir announced in paragraph 2 of public notice dated October 4, 1917, are additional to the operation and maintenance charges announced in paragraph 1 of this notice.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, APRIL 28, 1919.

1. **Status of State school lands.**—Prior to the enactment of the reclamation extension act of August 13, 1914 (38 Stat., 686), school lands of the State of South Dakota, lying within the Belle Fourche project, were subjected by State legislation (sec. 69, chap. 180, Laws of South Dakota, 1907) to the terms and conditions of the reclamation law, within the meaning of section 2 of said extension act. Until such lands are sold by the State, they have the status neither of private nor entered lands, but are rather in the same category as unentered public lands of the United States, and are not subject to the penalties provided by section 9 of said extension act.

2. **Construction charges.**—State school lands under public notice, lying within the first, second, third and fourth units of the Belle Fourche project, are subject to a construction charge of \$40 per irrigable acre, and such lands under public notice lying within the fifth unit of said project are subject to a construction charge of \$45 per irrigable acre. In each case said construction charge shall be paid by the water-right applicant in 10 equal annual instalments, the first of which shall be paid at the time of filing water-right application, and subsequent instalments shall be due and payable Decem-

ber 1 of each year thereafter: *Provided, however*, that if water-right application subject to the provisions of said reclamation extension act, or an acceptance of the provisions of said act, be filed within six months from the date of this notice for lands heretofore sold by the State, or within six months from the date of sale for lands hereafter sold by the State, said construction charge shall be payable in 20 instalments, the first of which shall be due and payable on December 1 following the date of water-right application, and subsequent instalments on December 1 of each year thereafter; in which event the first four instalments shall each be 2 per cent, the next two instalments each 4 per cent, and the next 14 each 6 per cent of the total construction charge. The whole or any part of the construction charge may be paid within any shorter period if so desired.

3. **Increased construction charges.**—In all cases where water-right application for the above-described lands shall not be made within one year from the date of this notice, for lands heretofore sold by the State or within one year after the date of sale by the State for lands hereafter sold by the State, the construction charge for such land shall be increased 5 per cent each year until such application is made.

4. **Amendment.**—Any public notice or order heretofore issued for the Belle Fourche project which may be in any manner inconsistent with this public notice, is amended to conform herewith.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Belle Fourche project, June 30, 1919.

Cash.....		\$2,967.74	
Inventory of materials and supplies on hand.....		23,373.24	
Accounts receivable:			
Current accounts.....	\$67,001.87		
Construction water-right charges unaccrued.....	2,053,709.48		
			2,120,711.35
Construction work contracted.....			60.00
Gross construction cost.....		3,479,801.66	
Less construction revenue earnings.....	\$13,799.40		
Less cost adjustments.....	2,735.29		
		16,534.69	
Net construction cost.....			3,463,266.97
Gross operation and maintenance cost.....		553,267.20	
Less operation and maintenance revenue earnings.....	4,569.11		
Less cost adjustments.....	1215.92		
		4,353.19	
			548,914.01
Accounts payable.....			16,900.40
Contingent obligations.....			3,019.40
Collections and contracts of specific amounts for repayments to reclamation fund.....			2,773,444.29
Net revenues from sale of town-site lots.....			61,878.46
Capital investment:			
Disbursement, transfer, and joint construction-vouchers received.....	4,104,082.40		
Collection, transfer, refund, and joint construction-vouchers issued.....	800,031.64		
			3,304,050.76
Net investment.....			

1 Contra entry.

Feature cost of Belle Fourche project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and survey.....		\$906.09
Storage works:		
Diversion Dam in Belle Fourche River.....	\$115,876.90	133,199.66
Feed canal.....	17,489.00	840,679.36
Belle Fourche Dam.....	24,172.90	1,260,222.27
Supplemental construction on Belle Fourche Dam.....		33,187.93
Johnson lateral storage investigations.....	3,276.79	3,578.14
Total.....	50,814.59	1,770,858.36
Canal system:		
North canal.....		590,521.56
South canal.....	5,238.33	493,889.50
Total.....	5,238.33	994,402.06
Lateral system:		
Lateral division A.....	99.30	252,781.75
Lateral division B.....		129,230.17
Lateral division C.....		67,710.48
Lateral division D.....	312.13	134,176.32
South canal extension.....		86,689.44
Completing unfinished deliveries.....	637.18	1,877.88
Willow Creek lateral investigations.....	427.22	1,216.78
Nine Mile Creek investigations.....	249.63	4,955.24
Total.....	1,226.20	628,648.01
Drainage system:		
Investigations.....		3,344.27
Supplemental construction (Deer Creek drain).....	3.50	3.50
Total.....	3.50	3,347.77
Farm unit surveys.....		6,246.64
Permanent improvements:		
Buildings.....	4,877.07	42,130.86
Real estate.....	54,107.10	
Total.....	49,230.03	42,130.86
Telephone system.....		14,583.67
Operation and maintenance charges transferred to and compounded with construction charges.....	889.65	18,778.20
Gross cost to June 30, 1919.....	8,933.24	3,479,891.66
Less revenues earned during construction period:		
Rental of buildings.....	596.55	6,088.95
Rental of grazing and farming lands.....	20.00	2,707.70
Rentals of irrigation water.....	110.00	1,020.00
Rentals of telephones and tolls.....	1.20	88.68
Contractors and freight refunds.....		2,880.32
Other revenues, unclassified.....	177.25	923.75
Profit on hospital operations.....		2,735.29
Total revenues.....	905.00	16,534.69
Net construction cost, June 30, 1919.....	8,028.24	3,463,286.97

¹ Amounts transferred from "Permanent improvements, real estate."

² Includes \$23,172.90 transferred from above feature; also \$1,000 cost adjustment credit.

³ Credit.

⁴ Includes \$230.67 transferred from "Permanent improvements, real estate."

Statement of cost, by calendar years, Belle Fourche project, South Dakota.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending Dec. 31—			
1909.....	\$2, 275, 751. 06		\$2, 275, 751. 06
1910.....	372, 235. 93		372, 235. 93
1911.....	438, 213. 28	\$26, 682. 90	534, 896. 18
1912.....	41, 906. 76	68, 011. 39	121, 818. 15
1913.....	32, 985. 37	55, 737. 46	88, 672. 83
1914.....	117, 067. 36	61, 081. 62	167, 157. 98
1915.....	60, 874. 22	47, 542. 16	117, 416. 38
1916.....	108, 886. 04	42, 106. 36	151, 992. 40
1917.....	11, 022. 24	71, 092. 36	73, 014. 60
1918.....	3, 622. 23	75, 047. 13	71, 569. 36
Jan. 1 to June 30, 1919.....	8, 257. 17	32, 442. 39	40, 699. 56
Balance in plant.....	3, 479, 801. 66	541, 422. 77	4, 021, 224. 43
Total.....	3, 479, 801. 66	553, 267. 20	4, 033, 068. 86

† De luct.

Statement of cost, by fiscal years, Belle Fourche project, South Dakota.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending June 30—			
1910.....	\$2, 422, 853. 38		\$2, 422, 853. 38
1911.....	467, 295. 63		467, 295. 63
1912.....	254, 448. 01	\$123, 399. 85	377, 847. 86
1913.....	2, 104. 72	61, 392. 66	68, 287. 94
1914.....	73, 888. 75	52, 594. 44	126, 483. 19
1915.....	109, 944. 28	55, 748. 66	165, 692. 94
1916.....	79, 919. 10	40, 943. 59	120, 862. 69
1917.....	66, 936. 69	53, 991. 66	121, 838. 35
1918.....	2, 312. 70	81, 446. 30	78, 133. 60
1919.....	8, 933. 24	73, 995. 61	82, 928. 85
Balance on plant.....	3, 479, 801. 66	541, 422. 77	4, 021, 224. 43
Total.....	3, 479, 801. 66	553, 267. 20	4, 033, 068. 86

† De luct.

Estimated cost of contemplated work, Belle Fourche project, during fiscal year 1920.

Principal features.	Estimated cost.
Storage system: Chicken Creek reservoir site.....	\$500
Lateral system.....	2, 500
Drainage system: Deer Creek drain.....	2, 000
Farm units: Willow Creek unit.....	900
Operation and maintenance under public notice.....	90, 600
Reimbursable accounts.....	1, 500
Total.....	98, 000

Operating-cost and revenues, Belle Fourche project to Dec. 31, 1918.

Item.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works:						
Diversion dam and inlet canal...	\$1,482.86	\$1,250.10	\$2,732.96			
Storage dam reservoir.....	1,958.29	492.64	2,450.93			
Total storage works.....	3,441.15	1,742.74	5,183.89	\$20,595.56	\$53,441.58	\$74,037.14
Canal system:						
North canal system.....	1,339.71	6,132.10	7,471.90			
South canal system.....	2,474.61	14,841.76	17,316.37			
Total canal system.....	3,814.32	20,973.95	24,788.27	32,323.02	113,105.56	145,524.58
Lateral system:						
North canal lateral system.....	7,479.95	19,188.72	26,668.67			
South canal lateral system.....	1,810.43	8,719.03	10,529.46			
Johnson lateral system.....	670.52	1,558.67	2,229.19			
Total lateral system.....	9,960.90	29,466.42	39,427.32	63,548.10	222,155.50	285,703.60
Drainage system.....					3,624.44	3,624.44
Maintenance of permanent improvements.....		4,688.15	4,688.15		12,027.18	12,027.18
Water-right adjudication investigations.....	3,868.35		3,868.35	3,868.35		3,868.35
Supplemental construction chargeable to operation and maintenance:						
(a) Cost to Aug. 31, 1914.....					2,735.60	2,735.60
(b) Cost since Sept. 1, 1914.....					326.86	326.86
Operation and maintenance cost. Unpaid operation and maintenance transferred to construction.....	21,084.72	56,871.26	77,955.98	120,341.03	407,506.72	527,847.75
Total.....			75,947.13			509,063.95
REVENUES.						
Operations and maintenance charges accrued on contracts with water-right applicants.....			87,527.44			1365,650.96
Operation and maintenance charges paid in advance by water-right applicants.....			239.10			543.86
Operation and maintenance charges paid and forfeited by water-right applicants.....						508.65
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			2,883.19			5,399.19
Rental of land and buildings during operating period.....			711.91			2,010.56
Rentals of irrigation water.....			383.75			1,958.44
Other revenues unclassified, earned during operating period.....			67.80			160.55
Less discount allowed on operating and maintenance charges accrued on contracts with water-right applicants.....			1,597.96			3,564.90
Total.....			90,215.23			372,667.31
Difference—						
Deficit.....						136,396.64
Excess.....			14,268.10			

* Includes \$87,527.44 accruals taken up in Jan., 1919.

* Deduct.

UTAH, STRAWBERRY VALLEY PROJECT.

J. L. LYTEL, project manager, Provo, Utah.

LOCATION.

Counties: Utah and Wasatch.

Townships: 9, 8 and 10 S., Rs. 1 to 3 E., Salt Lake base and meridian.

Railroads: Denver & Rio Grande; Salt Lake Route.

Railroad stations and estimated population, June 30, 1919: Payson, 3,000; Spanish Fork, 3,600; Springville, 3,700.

WATER SUPPLY.

Source of water supply: Strawberry and Spanish Fork Rivers and a number of small streams and springs not on the watersheds of these two. Contemplated pumping plants.

Area of drainage basins: Strawberry River, including Indian and Trail Hollow Creeks, 175 square miles; Spanish Fork River, 670 square miles.

Annual run-off in acre-feet: Strawberry River, including Indian and Trail Hollow Creeks, 1903-1912, maximum 150,000, minimum 49,000, mean 77,500; 1913-1918 (net inflow), maximum 104,000, minimum 35,000, mean 68,550. Spanish Fork River at Spanish Fork, 1903-1918, maximum 227,000, minimum 65,000, mean 122,520.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water during the season of 1919: 50,000 acres; reservoir has in storage 220,000 acre-feet available for irrigation purposes.

Length of irrigating season: April 15 to September 30, 169 days.

Average elevation of irrigable area: 4,600 feet above sea level.

Rainfall on irrigable area: At Provo, average 22 years, 14.67 inches: 1918, 18.29 inches. At Strawberry Reservoir: Average 6 years, 19.98 inches; 1918, 21.48 inches.

Range of temperature on irrigable area: -10° to 95° ; mean temperature at Provo, 49° F.

Character of soil on irrigable area: Sandy loam, heavy clay, and varying mixture of both; black alluvium; loam; and gravel. Much of the soil is underlaid by a coarse gravel, and the natural drainage is excellent.

Principal products: Alfalfa, hay, cereals, sugar beets, fruits, vegetables.

Principal markets: Salt Lake City, Utah, and adjacent towns and mining districts.

LANDS OPENED FOR IRRIGATION BY PUBLIC NOTICE.

Spanish Fork unit, Oct. 9, 1915; May 9, 1916; May 21, 1917; Apr. 30, 1918;	Acres.
Mar. 11, 1919	31, 351.84
Lake Shore unit, Oct. 8, 1915; May 9, 1916; May 21, 1917; Mar. 11, 1919 ..	5, 862.97
High-Line unit, May 13, 1916; May 21, 1917; Mar 11, 1919	21, 534.84
Power Canal unit, Jan. 14, 1918	60.00

Total

58, 809.65

In addition, the service has contracted to sell to Clinton, Soldier Fork, and Diamond Fork units, a total of 998.4 acre-feet of water per annum; also 4,707 acre-feet to the Mapleton irrigation district, 2,400 acre-feet to the Springville irrigation district with option to purchase 2,000 acre-feet more by May 1, 1920, 440 acre-feet to Spanish Fork City, and 1,700 acre-feet to Payson City.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1903.

Construction recommended by board of engineers October 2, 1905.

Construction authorized by Secretary, December 15, 1905.

Excavation of tunnel completed June 20, 1912.

Storing of water in Strawberry Reservoir begun July 14, 1912.

Construction of Indian Creek Dike completed September, 1912.

Strawberry tunnel formally opened September 13, 1913.

Construction of Strawberry Dam completed September 20, 1913.

Construction started on high-line canal January, 1915.

First storage water used for irrigation June 27, 1915.

Divisions 1 to 9, distribution system, practically completed December 31, 1915.

High-line canal turned over to water users, April 24, 1916.

Mapleton and Springville irrigation districts formed August 20, 1917, and September 4, 1917, respectively.

Mapleton lateral started March 15, 1918.

Mapleton lateral completed October 11, 1918.

Project as a whole 84 per cent completed, June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Strawberry Valley project provides for the storage of water in a reservoir on the Strawberry River; the discharge of the stored water through the Strawberry tunnel, approximately $3\frac{1}{2}$ miles long, into Diamond Fork, a tributary of the Spanish Fork River; and the diversion of water from the Spanish Fork River into canal systems, watering lands east and south of Utah Lake, in Utah County. A hydroelectric plant on the south side of the river supplies power for construction and commercial purposes. Part of the power developed may ultimately be used for pumping water for irrigation of high lands and drainage of low lands. The United States claims all waste, seepage, unappropriated spring, and percolating water arising within the project and purposes to use such water in connection therewith.

The high-line unit, comprising approximately 25,000 acres, has at the present time been brought under irrigation by means of a canal system constructed by the United States. The Spanish Fork and Lake Shore units are supplied with water through their existing canal systems, which were constructed by them. Any necessary enlargements or extensions will be made by the water users comprising the various canal companies, for according to the terms of the contract between the United States and the canal companies, the responsibility of the United States ends with the delivery of the water at the heads of the various canals. In the case of the Soldier Fork, Diamond Fork, and Clinton districts, water belonging to appropriators below the confluence of Diamond Fork with the Spanish Fork River is used by persons above this point, and an equal amount of water is released from the Strawberry Reservoir for the benefit of the prior appropriators. The water users build all of the ditches and other irrigation structures themselves.

The completed features of the irrigation plan are: Diversion dam on the Spanish Fork River, power canal, the first unit of the hydroelectric power plant on the Spanish Fork River, all of the canal system of the high-line unit, including all canals and laterals irrigating Goshen Valley and the land between the west side of West Mountain and Utah Lake, the Mapleton lateral, capacity 85 second-feet, irrigating approximately 10,000 acres of land in the vicinity of Mapleton and Springville, and the following features in connection with the Strawberry Reservoir: Strawberry Dam, Indian Creek Dike, Indian Creek and Trail Hollow feeder canal and appurtenant structures, and the East Portal camp. In connection with the construction of these features, 55 miles of wagon road, 44 miles of telephone lines, and 494 miles of high-tension transmission lines have been built. Power from the United States Reclamation Service power house is being supplied to the cities of Payson, Spanish Fork, Springville, and Salem for lighting and commercial purposes. The United States built the high-tension lines from its power house to these towns. The towns built their own substations, with the exception of Springville, and own their distributing system in all cases.

Two irrigation districts, Mapleton and Springville, have been formed under the State laws and contracts entered into between them and the United States for the purchase, under the Warren act, of about 7,107 acre-feet of water. Option has been given to the Springville irrigation district on an additional 2,000 acre-feet to be purchased by May 1, 1920.

In accordance with present plans, the work remaining to be done on the project consists of the construction of an extension of the high-line canal into Goshen Valley for the purpose of irrigating some 10,000 to 12,000 acres of land near Goshen and Elberta, the drainage of 7,400 acres of land in Goshen Valley north of the town of Goshen, and the drainage of 14,000 acres of land in what is known as the Payson Slough country north and east of Payson, in the vicinity of Salem, Benjamin, and Palmyra. All these plans are, however, tentative, and no work will be done, except the carrying on of the usual preliminary investigations, until the areas embraced in each are properly organized into irrigation or drainage districts under existing State laws, so that proper contracts may be made and United States investments protected.

No construction will be done on the Spanish Fork or Lake Shore units, as contracts with the canal companies on the units provide that the water from the project shall be delivered to the heads of the several existing canals and the companies shall deliver it from these points to the lands.

SUMMARY OF GENERAL DATA FOR STRAWBERRY VALLEY PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	60,000
Public land entered to June 30, 1919.....	1,854
Public land open to entry on June 30, 1919.....	46
Private land June 30, 1919.....	58,100
Acreage service could have supplied in season of 1918.....	50,000
Estimated acreage service can supply in season 1919.....	50,000
Estimated acreage service can supply in season 1920.....	50,000
Acreage irrigated season of 1918.....	32,539
Acreage cropped under irrigation season 1918.....	29,788

Crops:

Value of irrigated crops season of 1918.....	\$1,642,327.00
Value of irrigated crops per acre cropped.....	\$55.13

Finances:

Net construction cost to June 30, 1919.....	\$3,479,709.15
Per cent completed on June 30, 1919.....	84
Appropriated for fiscal year 1920.....	\$55,000.00
Estimated per cent complete by June 30, 1920.....	84
Proposed appropriation for fiscal year 1921.....	\$86,000
Estimated per cent complete by June 30, 1921.....	84
Announced construction charges per acre.....	\$80, \$90
Appropriation fiscal year 1919 ¹	\$59,000.00
Balance from fiscal year 1918 appropriation.....	52,515.42
Increase miscellaneous collections and transfers.....	39,791.77
Appropriation for increased compensation.....	2,917.74
	<u>\$154,224.93</u>

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$75,440.30
Transfers.....	6,918.69
Current liabilities.....	2,175.50
Contingent liabilities.....	250.00
	<u>84,784.49</u>

Unencumbered balance on July 1, 1919..... 69,440.44

Repayments:

Value of construction water-right contracts.....	2,596,600.15
Construction charges—	
Accrued to June 30, 1919.....	127,249.66
Collected to June 30, 1919.....	120,665.90
Uncollected on June 30, 1919.....	<u>6,583.76</u>
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	64,392.43
Collected to June 30, 1919.....	62,347.98
Uncollected on June 30, 1919.....	<u>2,044.45</u>
Water rental charges—	
Accrued to June 30, 1919.....	5,213.89
Collected to June 30, 1919.....	5,213.89
Power charges—	
Accrued to June 30, 1919.....	40,231.79
Collected on June 30, 1919.....	38,277.75
Uncollected on June 30, 1919.....	<u>1,954.04</u>

¹ The fiscal year 1919 appropriation carried also the unexpended balance of the fiscal year 1918 appropriation.

CONSTRUCTION DURING THE FISCAL YEAR.

Mapleton lateral.—No construction work was done during the year except the finishing of Mapleton lateral, which was started on March 15 and completed on October 11, 1918.

The construction of this lateral involved the excavation of 123,250 cubic yards of material; the construction of a reinforced concrete siphon, 46 inches in diameter, and 605 feet long, across the Spanish Fork River; a reinforced concrete siphon under the Denver & Rio Grande Railroad, 48 inches in diameter and 155 feet long; a double-barreled reinforced siphon, 27 inches in diameter, across Hobbie Creek Canyon; the erection of 25 standard wooden bridges over the lateral; 16 metal cross flumes for carriage of existing water ditches; 16 standard concrete turnouts; 6 cross culverts and one large wooden flume, 343 feet long. The construction was done for the most part by Government forces; a part, however, of the canal excavation was done by contract. The total cost of the lateral is approximately \$131,000. Losses in the organization due to operation of the Army drafts, inefficient labor, and high cost of materials due to war conditions increased to some extent the cost of this construction work.

SURVEYS AND INVESTIGATIONS.

Farm unit surveys.—During the year a considerable number of farm unit surveys were made on tracts of land desiring classification prior to signing up for water or changes made necessary by seepage.

Field surveys.—A special traverse was made from a point 80 feet above the Notch drop at Goshen Pass to a point above turnout 29 in the high-line canal.

The purpose of this survey was to determine the feasibility of installing two water turbines at the drops on the high-line canal at the Notch drop and turnout 30 for pumping water from the high-line canal to an elevation 80 feet above it and conveying this water to about 1,200 acres of land north of Santaquin, which at present has only a partial right from Santaquin Creek.

Proposed Nephi survey.—Negotiations have been opened up by landowners in Juab County near Mona and Nephi for the purpose of having a preliminary survey made of a high-line lateral to divert waters of the Strawberry Valley project to their lands. To defray the expense of this survey the sum of \$3,400 has been raised and placed to the credit of the United States; also a contract has been entered into between the United States and the landowners regarding the expenditure of this money. The length of the proposed canal is about 55 miles and it will have a capacity of 150 to 200 second-feet.

Investigations.—During the year investigations were carried on and reports made on the following secondary projects: Castle Peak, Dixie, Green River, Price River, and Hatch Town; and reports made on the seeped area in Utah, especially around Castle Dale and Utah Lake. Silt investigations of the Virgin River, Dixie project, were completed and work discontinued.

OPERATION AND MAINTENANCE.

Storage works.—The several features comprising the storage works were operated and maintained without any unusual trouble except for minor repairs made to Strawberry Tunnel. A survey was made of Strawberry Tunnel at the end of the 1918 irrigation season and all

cracks, rough places, and swellings noted on a profile, showing sides, floor, and arch. In the spring of 1919 a gang of men put in 24 timber sets, at four different places about 2 miles in from West Portal, to strengthen the sides and arch at places where swelling ground was breaking the concrete lining.

The guards at Strawberry Dam were dismissed after the signing of the armistice and maintenance of the structure was left to the regular operation and maintenance forces.

Power canal.—The power canal was operated without incident throughout the year. The Spanish Fork diversion dam and main distribution (power) canal were in charge of one gate tender and two assistants during the irrigation season. One man was also stationed at the forebay of the power plant. The duty of these men was to remove as much débris and silt from the canal as possible by the operation of the sand boxes at those places.

During the month of April repairs were made to the lower end of the wasteway at the power plant and new concrete placed in the bottom and sides. Large holes caused by erosion were found in both the upper and lower plunge basins. These holes were filled with concrete and new backfilling put in. Material placed consisted of about 40 cubic yards of rock backfill and 45 cubic yards of concrete.

Power plant.—The power plant was operated practically without interruption during the year, and power supplied under contract to the cities of Payson, Spanish Fork, Springville, and Salem. No. 1 generator unit was thoroughly overhauled during the year. Exciter turbines, wheel, and generator were dismantled and rebuilt. New wearing rings, wicket gates, crown plates, and shaft were put in and the unit was put in good operating condition.

Contracts were made during the year between the United States and the Mapleton Light & Power Co. and the Springville Canning Co. New contracts were executed with the cities of Spanish Fork, Payson, and Salem in which the rates were increased about 40 per cent.

Telephone and electric power transmission lines.—Repairs were made during July, 1918, to the telephone line between the power plant and East Portal of Strawberry Tunnel.

This line was washed out in several places by the action of water from Strawberry Tunnel. It was relocated at a higher elevation and altogether 28 new poles were set, 3,500 feet of new wire strung, and the line stubbed where required.

The transmission lines were operated satisfactorily throughout the year and the only repairs necessary were stubbing a few poles on the Spanish Fork line.

The present power contracts are as follows:

Power contracts, Strawberry Valley project, Utah.

Names of contractors.	Date of contracts.	Date of expiration of contracts.	Estimated maximum demand.
Spanish Fork City.....	Feb. 5, 1919	Feb. 5, 1922	Kilowatts. 150
Payson City.....	do.	do.	120
Springville City.....	June 21, 1917	July 28, 1920	125
Town of Salem.....	Feb. 5, 1919	Feb. 5, 1922	40
Mapleton Light & Power Co.....	May 31, 1919	May 31, 1924	5
Springville Canning Co.....	June 19, 1919	June 19, 1924	5
Joseph Lucas.....	Feb. 21, 1919	Feb. 21, 1922	5
Denver & Rio Grande R. R.....	(Pending).....		

Diamond Fork road.—A comparatively small amount of work was done during the year on the maintenance of Diamond Fork road. By arrangement with the county commissioners, the operation and maintenance of the first 12 miles of the road was turned over to Utah County. The United States Forest Service and Reclamation Service are, cooperatively, maintaining the balance of the road. The county's portion at the present time is washed out in several places by the action of waters from Strawberry Tunnel and extensive repairs must be made if the road is to be kept open.

A new cattle bridge was constructed during the spring of 1919 across Sixth Water Canyon at a point $1\frac{1}{2}$ miles below the West Portal rating flume. This bridge was erected to permit cattle to cross the river swollen by tunnel waters and heretofore cut off during the irrigation season.

Lateral system.—Lateral 34, of the high-line system was formally turned over to the Strawberry High Line Canal Co. by letter from the project manager under date of February 5, 1919.

Hydrometry.—The usual hydrometric investigations were carried on for the purpose of keeping to date the records of all the streams heretofore measured that are connected with the water supply of the project.

Fourteen regular gaging stations were maintained and 150 current meter measurements made during the year. One hydrographer, with automobile, carried on the work during the year and supervised the delivery of water to the several units of the project in accordance with the demand.

Investigation of silt condition was also made during the irrigation season of Spanish Fork River and several canals. The results showed a considerable lessening in the amount carried during previous years.

Farm units.—Approximately 500 new applications for water have been received during the year, mostly under the Spanish Fork unit. The acceptance of these new applications necessitated the examination of as many abstracts of title and the writing of legal opinions as to condition of the title at the time of acceptance.

Water deliveries.—A total of 32,539 acres were irrigated during the season of 1918. Of this total about 19,000 acres were under the high-line unit, 10,000 under the Spanish Fork and Lake Shore units, and about 3,500 acres under the Mapleton district.

Approximately 55,242 acre-feet of water were delivered to the water users at the headworks of the main canals during the irrigation season of 1918. Of this amount the high-line unit used 37,800 acre-feet, the Spanish Fork unit 12,415 acre-feet, the Lake Shore unit 2,011 acre-feet, and the Mapleton irrigation district 3,016 acre-feet.

Miscellaneous work.—Some assistance was rendered the State water-rights board by the project manager and the district counsel in connection with amendments to the State irrigation district laws and the State drainage district laws passed at the last session of the State legislature. Cooperative weather reports are kept on the project at Provo, Spanish Fork power plant, and East Portal of Strawberry Tunnel.

IRRIGATION DISTRICTS AND CITY WATER SUPPLY.

Springville irrigation district.—This district was duly organized under the State laws and a contract executed between it and the United States under date of December 29, 1917.

Under this contract the United States agrees to furnish the district 2,400 acre-feet of water annually for irrigation purposes. Also an option of 2,000 acre-feet was granted the district to be purchased on or before May 1, 1920, at the original contract price. This option has not yet been exercised, but the indications are that the district may purchase a part of it.

Mapleton irrigation district.—This district was duly organized under the State laws and a contract executed between it and the United States under date of January 2, 1918.

Under this contract the United States furnishes the district 3,600 acre-feet of water annually for irrigation purposes. An option on 400 acre-feet was granted the district at the original contract price. This option was taken up and a supplemental contract entered into under date of April 5, 1919, whereby the district purchased an additional 1,108 acre-feet. Negotiations are again in progress for the purchase of an additional 500 acre-feet but at an advanced price.

Payson City.—A contract was executed between Payson City and the United States of 200 acre-feet for water for irrigation and domestic purposes under the Warren Act. A supplemental contract is pending for the purchase of 1,500 acre-feet additional.

Spanish Fork City.—A contract was executed between Spanish Fork City and the United States under date of April 28, 1917, for the delivery by the United States of 400 acre-feet of water for irrigation and domestic purposes under the Warren Act. A supplemental contract was entered into under date of August 21, 1918, for the delivery of 40 acre-feet additional.

Miscellaneous.—Contracts are pending between the landowners above the high-line canal near Payson and the United States for the purchase by exchange of about 800 acre-feet of water under the Warren Act; also about 1,100 acre-feet may be purchased by the Salem Canal & Irrigation Co.

The United States at the present time is delivering by exchange under the Warren Act contracts 998.4 acre-feet to landowners under the Clinton, Soldier Fork, and Diamond Fork units.

DRAINAGE DISTRICTS.

Goshen drainage district.—No further investigations of this district were carried on during the fiscal year.

Payson Slough drainage district.—On April 9, 1919, a petition was received from landowners in the vicinity of Salem, Payson, and Benjamin, representing some 14,000 acres of land, asking that an investigation be made by the United States Reclamation Service to ascertain the feasibility of draining their lands and the probable cost of the drainage works. The drainage engineer from the Denver office visited the project on April 27, 1919, and submitted a report to the chief of construction under date of April 29.

GRAZING LANDS.

Strawberry Valley grazing lands.—The 60,160 acres of grazing land in Strawberry Valley, under lease to the Herber Horse and Cattle Growers' Association and the Wallaburg Live Stock Association, supported on an average during the season nearly 13,000 head of sheep, cattle, and horses. The water users on the project have submitted a request that they be permitted to take over these grazing lands at an annual fixed rental charge at the expiration of the present lease.

West Mountain grazing land.—On January 18, 1918, 5,250 acres of land lying on and along the slopes of West Mountain in T. 8 S., R. 1 E., Salt Lake base and meridian, were leased to Olof G. Peterson and John L. Ellertson for \$105 per year for 5 years. This land is used to lamb sheep on or for grazing sheep and cattle during the early spring.

Goshen Valley grazing lands.—The contract, dated July 17, 1917, between certain Goshen individuals and the United States for the leasing of 5,600 acres of land for grazing purposes at \$1,511 per year was canceled for nonpayment of lease price and the land released to C. F. Dixon for a period of one year for \$325. Just before the expiration of this last contract, the previous contractors petitioned for reinstatement of their lease by payment of the difference between the two contract prices. This was done and a supplemental contract was entered into April 15, 1919, which renewed the old contract in the entirety. The following statement shows grazing leases now in force:

Grazing leases, Strawberry Valley project, Utah.

	Date of lease.	Date of expiration of lease.	Value of lease.	Acreage of lease.
Strawberry Valley lands.....	Jan. 21, 1916	Nov. 15, 1920	\$10,500	8,320
Do.....	do.....	do.....	¹ 73,260	51,840
Goshen Valley lands.....	July 10, 1917	May 1, 1921	7,555	5,600
West Mountain lands.....	Jan. 18, 1918	Feb. 1, 1922	525	5,250
Goshen Gun Club.....	Jan. 10, 1919	Feb. 1, 1924	300	1,818.58
			² 92,130	72,828.58

¹ Rebates aggregate about \$12,130 for land covered by Strawberry Reservoir.

² Estimated net values of leases, \$80,000.

BOARD OF ENGINEERS.

A board of engineers, comprised of Messrs. C. T. Pease and James Munn, convened at Provo, May 31, 1919, to consider certain claims set forth in a petition of the board of directors of the Mapleton and Springville irrigation districts.

SETTLEMENT.

There is on the project practically no Government land susceptible of irrigation under existing units. The Government land opened for entry June 20, 1917, has been all entered, except four small isolated tracts. The present irrigation season has been extremely hot and

dry but the prospect for an abundant crop of fruit, hay, and grain is excellent. The dry spring damaged the starting of the sugar beets and a part of the acreage had to be replanted; however, indications point to an average yield in spite of this.

The new sugar beet factory at Springville was in operation during the fall and handled about 28,000 tons of beets. Three new pea viner stations have been put in at various places on the project and have had a stimulating effect on the cultivation of peas.

A new alfalfa mill is in the process of erection at Spanish Fork City.

The summer run-off of the Spanish Fork River is the lowest in 20 years and practically all crops are depending upon the use of stored water from Strawberry Reservoir this season.

Crop report, Strawberry Valley project, Utah, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	7,882	Ton.....	18,961	2.4	\$18.00	\$341,286	\$43.30
Alfalfa seed.....	31	Bushel.....	41	1.3	10.50	13.95	
Apples.....	78	Pound.....	361,700	4,635.0	.025	9,042	115.91
Barley.....	533	Bushel.....	22,613	42.5	1.44	32,563	61.38
Beans.....	86	do.....	587	6.9	6.00	3,522	40.96
Beets, sugar.....	5,273	Ton.....	60,524	11.5	10.00	605,240	114.78
Clover hay.....	26	do.....	74	2.8	20.00	1,480	57.00
Clover seed.....	90	Bushel.....	923	10.2	10.50	9,692	107.69
Corn.....	436	do.....	9,088	20.8	1.35	12,269	28.15
Corn fodder.....	15	Ton.....	79	5.2	5.00	395	26.33
Corn ensilage.....	26	do.....	262	10.0	15.00	3,922	150.00
Cherries.....	20	Pound.....	184,800	9,240.0	.09	16,632	831.60
Garden.....	147	do.....				6,965	47.60
Grapes.....	1	Pound.....	5,000	5,000.0	.09	450	450.00
Hay.....	648	Ton.....	743	1.14	15.00	11,145	17.65
Oats.....	1,768	Bushel.....	53,763	30.4	1.00	53,763	30.40
Pasture.....	1,783	do.....				14,225	7.98
Peaches.....	213	Pound.....	1,432,900	6,715.0	.03	42,987	201.50
Potatoes.....	431	Bushel.....	49,947	116.0	1.00	49,947	116.10
Prunes.....	1	Pound.....	5,000	5,000.0	.03	150	150.00
Sorghum.....	20	Ton.....	139	7.0	15.00	2,079	104.00
Tomatoes.....	38	Bushel.....	10,447	275.0	.45	4,701	123.60
Wheat.....	10,244	do.....	233,000	22.7	1.80	419,400	41.03
Less duplicated areas.....	2						
Total cropped acreage.....	29,788	Total and average.....				1,642,327	55.13
			Areas.	Acres.	Number farms.	Per cent of project.	
Summer fallowed.....	2,488	Total irrigable farms reported.....		35,000	1,200	70.0	
Irrigated, no crop.....	263	Total irrigated farms reported.....		32,539	1,100	65.0	
Total irrigated acreage.....	32,539	Under water-right applications.....		29,039	1,000	58.0	
		Under rental contracts.....		3,500	100	7.0	
		Total cropped area farms reported..		29,788	1,000	59.5	

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE.

MARCH 11, 1919.

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement of the annual operation and maintenance charges in the irrigation season of 1919 and thereafter

until further notice, for all lands of the Spanish Fork, Lake Shore and high-line units of the Strawberry Valley project, Utah, under public notice, is hereby made as follows:

2. **Spanish Fork and Lake Shore units.**—The minimum annual operation and maintenance charge for the Spanish Fork and Lake Shore Units shall be 50 cents per irrigable acre whether water is used or not, which charge will entitle the water user to not more than 1 acre-foot of water per irrigable acre and in no event to more than the amount per acre specified in the water-right application; and for all additional water a charge of 50 cents per acre-foot will be made; provided, that no additional water will be furnished to any water user who has not made water-right application for at least 2 acre-feet of water per irrigable acre for all irrigable land owned by him.

3. **High-line unit.**—The minimum annual operation and maintenance charge for the high-line unit shall be \$1 per irrigable acre whether water is used or not, which charge will entitle the water user to not more than 2 acre-feet of water per irrigable acre; and for all additional water a charge of 50 cents per acre-foot will be made; provided that no additional water will be furnished to any water user who has not made water-right application for at least 2 acre-feet of water per irrigable acre for all irrigable land owned by him. The terms and conditions both as to amount and place of measurement for delivery of water shall be the same for public lands included in the public notice of May 21, 1917, as for all other lands under this unit, namely, the delivery of 2 acre-feet per acre measured at the head of the high-line canal.

4. **Time of payment.**—All operation and maintenance charges will be due and payable on December 1 of each year for the preceding irrigation season, except that all charges for water additional to the amount specified in the water-right application are payable in advance when the water is ordered.

S. G. HOPKINS,

Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Strawberry Valley project, June 30, 1919.

Cash.....		\$9,081.77	
Inventory of materials and supplies on hand.....		22,055.94	
Accounts receivable:			
Current accounts receivable.....	\$13,362.09		
Construction water-right contracts unaccrued.....	2,469,350.49		
			2,482,712.58
Construction work contracted:			
Contract obligations.....	1,500.00		
Undelivered orders.....	250.00		
			1,750.00
Gross construction cost.....		3,508,003.73	
Less construction revenue earnings.....	\$8,301.77		
Add cost adjustments.....	17,992.81		
		26,294.58	
Net construction cost.....			3,479,709.15
Gross operation and maintenance cost.....		103,211.71	
Less operation and maintenance revenue earnings.....		8,673.54	
			94,538.17
Accounts payable.....			3,472.74
Contingent obligations.....			10,831.77
Collections and contracts of specific amounts for repayments to reclamation fund.....			2,659,516.55
Miscellaneous revenues.....			63,413.00
Capital investment:			
Disbursement, transfer, and joint construction vouchers received.....	3,908,218.17		
Collection, transfer, refund, and joint construction vouchers issued.....	555,605.22		
Net investment.....			3,352,612.95

Feature costs of Strawberry Valley project.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys, project as a whole:		
Reconnaissance.....	\$268.21	\$5,696.40
Trial lines.....		1,067.89
Topography.....		11,775.74
Soil surveys.....		362.76
Water rights.....		12,184.82
Experimental investigations.....		1,617.94
Subdivisions.....		321.62
Cross sections.....		12.16
Locations.....		6.05
Farm units.....		18.96
Triangulation.....		68.16
Level control.....		41.48
Hydrometry.....		15,684.29
	268.21	48,658.27
Storage system:		
Strawberry Dam.....	1457.11	159,242.90
Wasteway at Strawberry Dam.....	1161.66	56,314.99
Bridge over wasteway at Strawberry Dam.....	125.47	8,869.71
Sluicing tunnel at Strawberry Dam.....	1135.77	47,296.48
Indian Creek Dike.....	1241.83	118,908.59
Indian Creek and Trail Hollow diversion canals and bridge.....	1202.55	70,562.11
Indian Creek and Trail Hollow intake and spillway.....	162.54	21,793.41
Indian Creek and Trail Hollow terminal drop and chute.....	162.22	21,672.55
Strawberry Tunnel controlling works and intake.....	1282.68	96,474.68
Strawberry Tunnel proper.....	13,044.32	1,060,546.49
Strawberry Tunnel outlet weir.....	129.86	10,398.68
Measuring flume at west portal of Strawberry Tunnel.....	120.19	7,032.15
Permanent camp at east portal of Strawberry Tunnel.....	123.87	8,312.78
Submerged lands (storage reservoir).....		10,000.00
	14,849.57	1,699,415.52
Canal system:		
Main distribution and power canal—		
Spanish Fork Reservoir and River improvement.....		10,375.49
Spanish Fork diversion dam.....		39,695.90
Spanish Fork River bridge at diversion dam.....		2,524.60
Permanent camp at Spanish Fork diversion dam.....		6,812.71
Canal excavation.....		143,635.31
Canal concrete lining.....		42,659.60
Canal aqueduct.....		13,052.09
Culvert at station 139.....		2,584.20
Concrete arch and beam and slab covering.....		35,830.29
Tunnel No. 1, power canal.....		27,606.23
Tunnel No. 2, power canal.....		21,852.22
Minor structures, timber.....		8,263.33
Minor structures, concrete.....		1,634.76
Wasteway, sandbox, and inlet chamber.....		24,750.02
		379,279.75
High Line Canal:		
Examination and surveys.....		38,835.41
Headworks.....		4,364.26
Canal excavation.....		148,342.34
Canal lining, concrete.....		108,465.67
Tunnel No. 1, high-line canal.....		8,824.12
Peteetneet siphon.....		7,915.83
Peteetneet Inlet dam.....		1,955.66
State road bridge, concrete.....		2,069.93
Siphon under San Pedro, Los Angeles & Salt Lake R. R.....		3,946.00
Notch drop and chute, Goshen Pass.....		561.80
Siphon under Denver & Rio Grande R. R., Goshen Pass.....		1,824.70
Spillway at head of lateral 33.....		1,510.60
Flume 9-foot concrete near power house and Payson Hill.....		44,706.18
Flume 8-foot concrete, near Goshen Pass.....		5,361.51
Flume, double-barrel, covered, concrete.....		13,889.72
Turnouts with checks.....		3,778.34
Minor structures, concrete.....		4,794.22
Minor structures, timber.....		19,120.28
Turnout No. 9 and bridge No. 6.....		1,687.67
Turnout No. 30 and measuring device.....		4,137.73
Minor structures, pipe.....		4,992.58
Flume, wood, division 2, near Salem.....		1,334.30
Turnout No. 3 (division 1).....		3,007.26
		435,426.30
Total canal system.....		814,705.95

¹ Credits shown cover adjustment of charges previously made to cover freight and handling of equipment and unused materials purchased for the construction of the storage system. No costs charged to this feature during fiscal year 1919.

Feature costs of Strawberry Valley project—Continued.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Lateral systems:		
Divisions 5, 6, 7, 8, and 9—		
Examination and surveys.....		\$37,262.88
Lateral excavation.....		32,432.71
Lateral lining, concrete.....		191,056.52
Metal flume, 3 feet 2½ inches.....		2,180.87
Metal flume, 3 feet 9½ inches.....		1,088.47
Siphon, 30 inches, steel, lateral No. 3.....		3,899.07
Siphon, 36 inches, cast iron, lateral No. 30.....		811.77
State road siphon and turnout No. 20.....		906.58
Siphon under San Pedro, Los Angeles & Salt Lake R. R., 24 inches, cast iron and vitrified pipe, lateral 28.....		4,164.85
Siphon under Denver & Río Grande R. R. and turnout No. 20 P. & Q., 36-inch cast iron pipe.....		1,113.74
Siphon under San Pedro, Los Angeles & Salt Lake R. R., 30-inch cast- iron pipe, lateral 20-R.....		816.76
Siphon, 18 inches, vitrified pipe, lateral 27.....		1,545.77
Siphon, state road and turnout 20-CD.....		1,199.48
Minor structures, concrete.....		47,213.06
Minor structures, timber.....		2,766.63
Minor structures, pipe.....		20,666.00
Minor structures, metal.....		1,624.41
		350,761.06
Division 10—		
Lateral excavation.....		35,289.93
Lateral concrete canal lining.....		104,652.31
Metal flumes, Nos. 1, 3, and 12, 3 feet 2½ inches.....		3,355.31
Metal flumes, Nos. 4, 5, and 6, 5 feet 8½ inches.....		2,892.36
Metal flumes, Nos. 7, 8, 9, 10, and 11, 4 feet 5½ inches.....		22,150.99
Metal flume, No. 13, 1 foot 11 inches.....		1,614.62
Measuring boxes, concrete for turnouts 32-EF and 32-CD.....		1,502.01
Siphon, 36 inches, steel, lateral 31.....		6,780.92
Pipe line, double-barrel, 24-inch vitrified pipe, lateral 31.....		5,264.83
Culverts, 24-inch vitrified pipe, lateral 31.....		3,940.40
Culverts, state road and turnout 31-E2.....		1,218.22
Minor structures, concrete.....		17,641.59
Minor structures, timber.....		2,196.60
Minor structures, pipe.....		9,488.84
		217,988.93
Mapleton lateral—		
Preliminary surveys.....		2,734.81
Lateral excavation.....	\$8,065.01	61,136.76
Lateral lining, concrete.....	431.29	997.90
Headworks, intake at Power Canal.....	50.99	2,319.88
Siphon over Spanish Fork River, concrete, 46 inches.....	90.01	16,869.91
Siphon under Denver & Río Grande R. R., concrete, 46 inches.....	617.83	6,487.33
Siphon over Hobbie Creek, concrete, 27 inches.....	21,193.40	21,718.82
Minor structures, concrete.....	5,840.41	9,314.01
Minor structures, pipe.....	155.66	348.33
Minor structures, timber.....	3,692.01	5,499.04
Minor structures, metal.....	1,373.16	2,768.52
	41,539.77	130,195.31
Total lateral systems.....	41,539.77	698,945.30
Power system:		
Hydroelectric power plant.....		36,279.74
Penstock.....		8,241.13
Substation at Springville.....		3,479.64
Transmission lines to Spanish Fork.....		3,556.85
Transmission lines to Payson City.....		6,810.27
Transmission lines to Springville.....		6,601.30
Power house permanent camp.....		15,328.18
		80,297.11
Farm units.....		9,025.68
Permanent improvements:		
Diamond Fork wagon road.....		48,877.00
Provo office and grounds.....		5,260.00
Strawberry Valley grazing lands.....		61,085.65
		115,222.25

Feature costs of Strawberry Valley projects—Continued.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Telephone system: Line from Spanish Fork to Strawberry Dam.....	.....	\$14,061.19
Operation and maintenance during construction .....	.....	12,511.90
Total cost of construction features.....	\$36,958.41	3,492,834.17
Balance in plant account.....	.....	13,169.56
Gross construction cost to June 30, 1919.....	36,958.41	3,506,003.73
Less revenues earned during construction period:		
Rental of buildings.....	.....	5,675.80
Rental of grazing and farming lands.....	.....	45,664.56
Net power losses (prior to public notice).....	.....	125,145.19
Rental of irrigation water.....	.....	400.00
Rental of telephone and tolls.....	.....	1,318.82
Contractors' freight refunds.....	.....	691.61
Loss on hospital operation.....	169.10	12,526.56
Revenues, miscellaneous.....	215.54	215.54
	384.64	26,294.58
Net construction cost, June 30, 1919.....	36,573.77	3,479,709.15

¹ Deduct.*Statement of costs by calendar years, Strawberry Valley project.*

	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
Year ending Dec. 31—					
1907.....	\$358,107.73	.....	.....	.....	\$358,107.73
1908.....	299,775.33	.....	.....	.....	299,775.33
1909.....	200,684.30	.....	.....	.....	200,684.30
1910.....	234,577.92	.....	.....	.....	234,577.92
1911.....	538,013.86	.....	.....	.....	538,013.86
1912.....	772,509.84	.....	.....	.....	772,509.84
1913.....	11,870.02	.....	.....	.....	11,870.02
1914.....	5,733.63	\$69,420.68	.....	\$69,420.68	75,154.31
1915.....	746,220.44	3,779.23	\$8,323.31	12,102.54	758,322.98
1916.....	194,074.66	60,688.01	18,037.06	142,665.95	151,423.71
1917.....	48,967.28	.....	30,697.72	30,697.72	79,685.00
1918.....	126,370.73	.....	28,792.96	28,792.96	155,163.69
Jan. 1 to June 30, 1919.....	12,863.43	.....	17,360.66	17,360.66	14,497.23
Subtotal.....	3,490,322.27	12,511.90	103,211.71	115,723.61	3,596,045.88
Plant accounts to June 30, 1919.....	13,169.56	.....	.....	.....	13,169.56
Total.....	3,493,491.83	12,511.90	103,211.71	115,723.61	3,609,215.44

¹ Deduct.

NOTE.—The project was opened under public notice in 1915, and the appropriate costs for operation and maintenance under public notice were opened and taken out of operation and maintenance during construction.

The above operation and maintenance cost of \$28,792.96, shown for calendar year 1918, includes an adjustment of \$2,298.05 made in June, 1918, between power system operation and maintenance costs and irrigation operation and maintenance costs, in accordance with the plans set forth in the board of engineers' report, dated Mar. 16, 1918. The true cost for calendar year 1918 is \$26,494.91.

The true construction cost for the period from Jan. 1 to June 30, 1919, is \$1,986.14. The amount shown (\$2,863.43—credit) covers the difference between the true cost for this period and an adjustment made during this period of the storage system costs. (See Feature costs—storage system.)

Statement of costs by fiscal years, Strawberry Valley project.

	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
Year ending June 30—					
1906.....	\$45,409.35	.....	.....	.....	\$45,409.35
1907.....	88,401.94	.....	.....	.....	88,401.94
1908.....	292,288.51	.....	.....	.....	292,288.51
1909.....	287,815.86	.....	.....	.....	287,815.86
1910.....	193,766.85	.....	.....	.....	193,766.85
1911.....	306,110.46	.....	.....	.....	306,110.46
1912.....	691,590.78	.....	.....	.....	691,590.78
1913.....	381,828.93	.....	.....	.....	381,828.93
1914.....	52,519.18	\$50,693.04	.....	\$50,693.04	103,212.22
1915.....	389,975.33	28,165.77	.....	28,165.77	418,141.10
1916.....	377,203.63	7,180.11	.....	7,180.11	384,383.74
1917.....	260,762.18	¹ 73,527.02	\$36,505.07	¹ 37,021.95	223,740.23
1918.....	75,680.86	.....	35,064.62	35,064.62	110,745.48
1919.....	36,958.41	.....	31,642.02	31,642.02	68,600.43
Subtotal.....	3,480,322.27	12,511.90	103,211.71	115,723.61	3,596,045.88
Plant accounts to June 30, 1919.....	13,169.56	.....	.....	.....	13,169.56
Total.....	3,493,491.83	12,511.90	103,211.71	115,723.61	3,609,215.44

¹ Deduct.

NOTE.—The project was opened under public notice in 1915, and the appropriate costs for operation and maintenance under public notice were opened and taken out of the operation and maintenance during construction.

Estimated cost of contemplated work, Strawberry Valley project, during fiscal year 1920.

Principal feature.	Estimated cost.
Examination and surveys: Preliminary investigations of proposed extension of canal into Juab County.....	\$3,409.78
Lateral system: Final settlement of contract with Green Construction Co.....	4,551.43
Operation and maintenance under public notice.....	30,000.00
Reimbursable accounts.....	7,200.00
Total.....	45,161.21

Operating costs and revenue, Strawberry Valley project, to Dec. 31, 1918.

Features.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage system:						
Strawberry Dam.....	\$2,438.76	\$93.35	\$2,532.11	\$4,258.02	\$6,071.46	\$10,329.48
Indian Creek Dike.....	340.76	.....	340.76	1,293.59	779.60	2,073.19
Indian Creek feeder canal.....	92.22	.....	92.22	1,016.12	373.76	1,389.88
Trail Hollow feeder canal.....	92.33	.....	92.33	977.87	186.69	1,164.56
Strawberry Tunnel.....	2,521.32	1,960.19	4,481.51	5,443.39	2,914.80	8,358.19
West portal weir.....	.....	.....	.....	.....	22.40	22.40
Total storage system.....	5,485.49	2,053.54	7,539.03	12,988.99	10,348.71	23,337.70
Canal system:						
High-line canal.....	.....	.....	.....	599.34	40.02	639.36
Watercourse between Strawberry Tunnel and Spanish Fork diversion dam.....	6.00	988.87	994.87	68.95	2,821.68	2,890.63
West portal measuring flume.....	.....	.....	.....	125.86	3,073.04	3,198.90
Spanish Fork diversion dam.....	860.63	181.76	1,042.39	1,106.24	1,590.28	2,696.52

Operating costs and revenue, Strawberry Valley project, to Dec. 31, 1918—Continued.

Features.	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
costs—Continued.						
Canal system—Continued.						
Main distribution and power canal.....	\$658.50	\$402.48	\$1,061.07	\$4,468.94	\$3,961.43	\$8,430.37
Total canal system.....	1,525.22	1,573.11	3,098.33	6,339.33	11,486.45	17,825.78
Lateral system:						
High-line canal laterals.....				279.35	32.71	312.06
Mapleton lateral.....	443.87	1,644.83	2,088.70	443.87	1,644.83	2,088.70
Total lateral system.....	443.87	1,644.83	2,088.70	723.22	1,677.54	2,400.76
Undistributed expenses:						
Telephone system.....	463.71	54.48	518.19	2,029.98	1,771.62	3,801.60
Camp maintenance.....	567.79	176.27	744.06	992.37	886.00	1,858.37
Superintendence and accounts..	1,392.83	353.71	1,746.54	1,539.13	1,443.15	2,982.28
Engineering and inspection.....	172.72	63.28	236.00	210.33	100.90	311.23
General expense.....	5,387.31	1,396.90	6,784.21	6,969.21	5,577.44	12,546.65
Total, undistributed expenses.	7,984.36	2,074.64	10,059.00	11,741.02	9,759.11	21,500.13
Miscellaneous features:						
Hydrometry.....	3,428.13		3,428.13	12,484.31		12,484.31
Operation and maintenance surveys and investigations.....	267.49		267.49	1,843.16		1,843.16
Maintenance of Diamond Fork road.....		14.23	14.23		6,366.29	6,366.29
Maintenance of Diamond Fork road bridges.....					92.92	92.92
Total, miscellaneous features..	3,695.62	14.23	3,709.85	14,327.47	6,459.21	20,786.68
Grand total.....	19,134.56	7,360.35	26,494.91	46,120.03	39,731.02	85,851.05
REVENUES.						
Operation and maintenance charges accrued on contracts with the water-right applicants.....			25,040.43			64,126.00
Operation and maintenance charges paid in advance by water-right applicants.....			2.77			3.17
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			98.06			190.63
Rental of land and buildings during operation period.....			551.50			1,755.00
Rental of irrigation water.....			2,503.00			4,813.99
Rental of telephone and tolls during operation period.....			66.12			411.17
Revenues, miscellaneous.....			1,151.20			1,151.20
Less discount allowed on operation and maintenance charges accrued on contracts with the water-right applicants (contra).....			¹ 971.63			¹ 2,515.45
Total.....			29,441.44			69,935.61
Difference:						
Excess.....			2,946.53			
Deficit.....						15,915.44

¹ Deduct.

NOTE.—The operation and maintenance deficit was reduced by nearly \$3,000 during the irrigation year of 1918. Considerable more water has been sold during the present irrigation season, and it is estimated that this deficit will be eliminated by the end of the 1919 irrigation year.

WASHINGTON, OKANOGAN PROJECT.

CALVIN CASTEEL, project manager, Okanogan, Wash.

LOCATION.

County: Okanogan.
Townships: 33 to 34 N., Rs. 25 to 27 E., Willamette meridian.
Railroad: Great Northern (branch line).
Railroad stations and estimated population, June 30, 1919: Okanogan, 1,200; Omak, 600; Riverside, 250.

WATER SUPPLY.

Source of water supply: Salmon Creek.
Area of drainage basin: 121 square miles above Conconully Dam.
Annual run-off in acre-feet of Salmon Creek at Jones ranch, near Okanogan (140 square miles), 1903 to 1918, maximum 56,500, minimum 7,639, mean 31,885.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to supply water, season of 1919: 10,099.
Area under water-right applications, rental and vested water-right contracts to June 30, 1919: 10,099.
Length of irrigation season, May 1 to September 1: 122 days.
Average elevation of irrigable area: 1,000 feet above sea level.
Rainfall on irrigable area: At Omak, Wash., 9-year average, 11.83 inches; 1918, 10.25 inches. At Conconully, Wash., at base of Salmon River watershed, 19-year average, 15.16 inches; 1918, 11.74 inches.
Range of temperature on irrigable area: -10° to 105° F.
Character of soil of irrigable area: Volcanic ash and gravel on upper benches and sand and gravel on lowlands along Okanogan River.
Principal products: Fruit, hay, grain, and vegetables.
Principal markets: States east.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: November 12, 1908; March 12, 1910; April 8, 1910; February 23, 1911; March 28, 1911; April 29, 1912; July 6, 1912; March 10, 1913; June 16, 1913; January 16 and September 24, 1914; March 20, May 15, and July 28, 1915; March 16, 1916; April 18, 1917; March 19 and May 18, 1918; August 29, 1918; September 10, 1918; April 26, 1919.

Location of lands opened: Tps. 33 and 34 N., Rs. 25 to 27 E., Willamette meridian.

Limit of area of farm units: Public, 40 acres; private, 40 acres.

Duty of water: 2½ acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land: \$95, subject of credit of \$16 per acre in certain cases where landowners constructed and operate and maintain their own ditches.

Annual operation and maintenance charge: Effective for the season of 1919, and thereafter until further notice, by public notice dated April 26, 1919, the annual operation and maintenance charge is a minimum of \$4 per irrigable acre, whether water is used thereon or not, which entitles the water user to 1 acre-foot of water delivered at his land, additional water being furnished at the rate of \$1.50 for the first acre-foot and all further supply at \$3 per acre-foot. During the flood period of each year each water user will be charged with only two-thirds of the water delivered to him.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1903.
Construction recommended by board of engineers, October 9, 1905.
Construction authorized by Secretary, December 2, 1905.

First irrigation by Reclamation Service, season of 1908.

Conconully Dam completed August, 1910.

Water surface in Conconully Reservoir, reached spillway crest for first time on May 19, 1914.

Power and pumping system completed, 1916.

Concrete lining of canals and extension of distribution system completed, 1917.

Third unit opened, 1917.

Supplemental construction approved, November, 1918.

Project 75 per cent completed, June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Okanogan project provides for the storage of water in Conconully Reservoir and Salmon Lake Reservoir, controlled by Conconully Dam on Salmon Creek, about 2 miles below Conconully, Wash., and Salmon Lake Dam on Salmon Lake, about 1 mile above Conconully Wash.; the control of Salmon Lake Reservoir by a short feeder canal from Salmon Creek and outlet works; the control of Conconully Reservoir by means of an outlet tunnel discharging into Salmon Creek below the storage dam; the diversion of water from Salmon Creek by a dam about 12 miles below the reservoir into a canal system watering lands in the valley of the Okanogan River between Riverside and Okanogan, Wash.; the operation of a pumping plant to supplement the gravity supply of the project by pumping from the Okanogan River to approximately 1,050 acres of land on the sandy portion of the project known as Robinson Flat, where the duty of water is less than on the heavier soils. The power for the pumping is generated by two power plants constructed at drops Nos. 1 and 2 on the upper main lateral and transmitted to the pumping station near the town of Omak, Wash., by 5½ miles of transmission line. This pumping plant is to be operated only during the years when the gravity supply of water will not be sufficient. An oil-engine pumping plant was installed at Duck Lake during the season of 1918 to supplement the water supply for about 640 acres of project lands near this lake.

The features of the project, covered by original construction, consisting of the inlet and outlet works, Salmon Lake, Conconully hydraulic filled dam, spillway, and outlet works, the diversion weir, and distribution system, are completed and have been in use during irrigation seasons since 1910. The features of the project covered by supplemental construction, consisting of Salmon Lake Reservoir and Duck Lake pumping plant, are now in the course of construction.

SUMMARY OF GENERAL DATA FOR OKANOGAN PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	10,099
Private land.....	10,099
Acreage service could have supplied in season of 1918.....	10,099
Estimated acreage service can supply in season of 1919.....	10,099
Estimated acreage service can supply in season of 1920.....	10,099
Acreage irrigated season of 1918.....	6,402
Acreage cropped under irrigation season of 1918.....	5,287

Crops:

Value of irrigated crops season of 1918.....	\$749,982.00
Value of irrigated crops per acre cropped.....	\$141.85

Finances:

Net construction cost to June 30, 1919.....	\$392,845.36
Per cent completed on June 30, 1919.....	75
Appropriated for fiscal year 1920.....	\$325,000.00
Estimated per cent complete by June 30, 1920.....	90
Proposed appropriation for fiscal year 1921.....	\$196,000.00
Estimated per cent complete by June 30, 1921.....	100
Announced construction charges per acre.....	\$95.00
Appropriation fiscal year 1919.....	\$154,000.00
Miscellaneous collection and transfers.....	\$4,681.13
Increased compensation.....	3,605.99
	162,287.12

Finances—Continued.

Expenditures chargeable to 1919 appropriation—	
Disbursements.....	\$115,826.89
Transfers.....	9,080.38
Current liabilities.....	21,529.15
Contingent liabilities.....	443.00
	<hr/>
Unencumbered balance on July 1, 1919.....	\$146,879.42 15,407.70
<hr/>	
Repayments:	
Value of construction water-right contracts.....	812,014.02
<hr/>	
Construction charges—	
Accrued to June 30, 1919.....	34,130.06
Collected to June 30, 1919.....	31,569.75
	<hr/>
Uncollected on June 30, 1919.....	2,560.31
<hr/>	
Operation and maintenance charges (public notice)—	
Accrued to June 30, 1919.....	70,711.26
Collected to June 30, 1919.....	47,960.98
	<hr/>
Uncollected on June 30, 1919.....	22,750.28
<hr/>	
Water-rental charges—	
Accrued to June 30, 1919.....	108,314.57
Collected to June 30, 1919.....	104,292.75
	<hr/>
Uncollected on June 30, 1919.....	4,021.82
<hr/>	
Power charges—	
Accrued to June 30, 1919.....	1,754.71
Collected to June 30, 1919.....	1,754.71

CONSTRUCTION DURING THE FISCAL YEAR.

All features of original contemplated work had practically been completed at the close of the fiscal year 1917.

Supplemental construction, storage system.—The enlargement of Conconully Dam and the construction of Salmon Lake Dam were begun in December, 1918, and were in progress at the end of the fiscal year.

Supplemental construction, pumping for irrigation.—An oil engine pumping plant was installed during the summer of 1918 at Duck Lake. Only a temporary building was erected, to be replaced later by a permanent structure.

SEEPAGE AND DRAINAGE.

Drainage has not been necessary on the Okanogan project with two or three exceptions on small areas. Because of the smallness of these areas and the improbability of any further damage resulting from seepage no steps have been taken by the service to do any drainage work.

BOARD MEETINGS.

Date.	Topic.	Personnel.
Aug. 9, 1919.....	Increased water supply.....	Ferd Bonstedt, Jas. M. Gaylord, John S. Longwell, J. L. Savage.
Sept. 14-19, 1919.....	Salmon Lake Dam construction...	D. C. Henny, A. J. Wiley, Ferd Bonstedt, Calvin Casteel.
Nov. 6-9, 1919.....	.....do.....	James Munn, D. C. Henny, L. V. Branch, Ferd Bonstedt, Calvin Casteel.

OPERATION AND MAINTENANCE.

The early winter of 1918 promised a shortage of water for the season because of the lack of snow in the mountains. The water shortage became evident early in the season when the run-off in Salmon Creek did not pick up to the usual flood proportions.

The water shortage made necessary emergency measures to secure more water for the project lands, and two large pumping plants were accordingly installed for pumping additional water, one at Conconully to pump from Salmon Lake Reservoir below the gate sill into Conconully Reservoir and the other to pump from Duck Lake into the upper main lateral. These plants were completed in July and August and were both set to work immediately. The Conconully plant delivers about 25 second-feet and the Duck Lake plant 10 second-feet.

The extreme shortage of water made necessary the delivery of water in rotation heads and then to cut the water off for some time. The subscribed water-right lands were delivered only 0.58 acre-foot during the season from the project canals. Many farmers secured a larger delivery by pumping water from wells, lakes, and springs.

The run-off for 1918 amounted to 7,639 acre-feet, 1,851 more was pumped from Salmon Lake, and 280 additional acre-feet from Duck Lake, making a total of 9,770 acre-feet available for all lands. The rainfall was also short for the season, all of the shortage occurring during the spring months.

The crops for the season of 1918 were not nearly so large as they would have been if the water had not been short. Notwithstanding, the returns to the project farmers were excellent and amounted to over \$141 per acre for the area cropped. These crop returns were on fruit principally, as all other crops were sacrificed to save the fruit trees.

Some damage was done to trees on the project, but in no instances were the losses large to any one farmer. The alfalfa was badly injured in many cases.

The winter of 1918-19 promised a much better water supply than that of 1918. In general the weather was mild with the snowfall only slightly less than normal. No water was carried over from the previous year and the reservoir did not receive so much water from Salmon Creek as was anticipated. The spring months were very cold and backward which held back the melting of the snows and allowed the water to sink into the ground.

Early in the spring another season with a short water supply was foreseen. The possibility of securing additional water was considered early, and it was decided to pump about 1,000 acre-feet from Salmon Lake and to run the Duck Lake and Robinson Flat pumping plants to capacity all the time possible.

Water was started in the canals on May 7, and continued until the 23d. The second irrigation was started on June 8 and cut off on the 21st. During these two months, practically 0.6 of an acre-foot per acre was delivered to all lands.

At the close of June, preparations were being made to start the water for the third irrigation. The total precipitation for the year ending June 30, 1919, was 13.85 inches, which was more than double

that for the preceding year. All of the small private pumping plants used in 1918 by the farmers were used again this season to supplement their supply.

The area irrigated this season was 6,500 acres, the decrease being due to the abandonment of sandy lands.

Historical review, Okanogan project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water.....	10,099	10,099	10,099	10,099	10,099	10,099
Acreage irrigated.....	7,740	7,800	7,850	8,000	6,402	6,500
Miles of canal operated.....	74	77	77	79	79	79
Water diverted (acre-feet).....	29,700	24,640	25,947	25,182	9,770	11,000
Water delivered to land (acre-feet).....	20,035	18,590	19,615	19,801	6,339	8,250
Per acre of land irrigated (acre-feet).....	2.59	2.38	2.50	2.49	.99	1.27

SETTLEMENT.

There was little movement of land. A few tracts changed hands at prices ranging from \$650 to \$1,000 per acre for bearing orchards. Those sales were made to local and outside parties. Very good prices were received for the crops and a fair crop was produced in the majority of instances. The financial condition of the farmers is good.

The land investment report, compiled at the close of the season of 1918, shows a total gross land value for the project of \$2,377,000, or about \$370 per acre for the area cleared and leveled. The total value of stock and equipment is approximately \$254,000, or about \$40 per acre, based on the area cleared and leveled. The bank deposits of the three towns in and adjacent to the project have shown no increase. Some development work was done during the year, consisting of the building of packing sheds and the letting of contracts for additions to present central packing and assembling plants. Many automobiles, trucks, and tractors are being purchased by the farmers. The towns are making a steady and healthy growth.

Settlement data, Okanogan project.

Item.	1915	1916	1917	1918	1919
Total number of farms on project.....	580	580	580	594	594
Population.....	900	1,021	1,050	1,162	1,200
Number of irrigated farms.....	440	458	475	401	400
Operated by owners or managers.....	424	453	465	378	375
Operated by tenants.....	6	5	10	23	25
Population.....	900	1,021	1,050	1,162	1,160
Number of towns.....	3	3	3	3	3
Population.....	1,500	1,600	1,700	2,050	2,200
Total population in towns and on farms.....	2,400	2,621	2,750	3,212	3,360
Number of public schools.....	7	7	7	7	7
Number of churches.....	8	8	8	8	8
Number of banks.....	4	4	4	4	4
Total capital stock.....	\$135,000	\$135,000	\$135,000	\$135,000	\$135,000
Amount of deposits.....	\$325,000	\$400,000	\$450,000	\$500,000	\$600,000
Number of depositors.....	1,650	1,700	1,750	1,800	1,800

PRINCIPAL CROPS.

The area cropped during the year was 5,287 acres. The total value of the crops produced was \$749,982.05 or \$141.85 per acre cropped. The decrease in cropped area was due principally to the abandonment of sandy lands embraced in the second unit of the project. Although the acreage cropped shows a decrease of 16 per cent, the value of crops produced increased approximately 22 per cent. This increase was due mainly to the increase in the price of apples and alfalfa over the previous year, the average price of alfalfa being \$25 per ton and of apples 4½ cents per pound. Of the 6,400 acres irrigated, 4,840 are planted to bearing and nonbearing orchards. The apple returns average \$1.80 per box for a total of 360,000 boxes or 475 carloads.

Crop report, Okanogan project, Washington, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	1,514	Tons.....	2,228	1.5	\$25.00	\$55,700	\$36.79
Apples.....	3,846	Pounds.....	14,382,080	3,740	.04½	647,194	168.00
Apricots.....	14	do.....	51,625	3,687	.028	1,445	103.25
Beans.....	25	Bushels.....	115	5	6.60	759	30.36
Beets.....	1	Tons.....	2			2	
Carrots.....	1	do.....	3	3	40.00	120	120.00
Corn.....	68	Bushels.....	1,760	26	1.50	2,640	38.80
Corn fodder.....	53	Tons.....	81	1.5	10.00	810	15.30
Small fruit.....	3	Pounds.....	9,200	3,066	.066	607	202.40
Garden.....	98					13,805	140.90
Hay.....	148	Tons.....	200	1.4	25.00	5,000	33.80
Onions.....	1	Pounds.....	3,700	3,700	.04	148	148.00
Pasture.....	142					2,620	18.45
Peaches.....	29	Pounds.....	124,000	4,290	.025	3,190	110.00
Pears.....	27	do.....	161,720	5,990	.03½	5,060	187.40
Prunes.....	5	do.....	81,000	16,200	.03	2,430	486.00
Potatoes.....	46	Bushels.....	3,896	88	1.25	4,870	110.70
Wheat.....	94	do.....	258	2.7	1.93	499	5.20
Miscellaneous.....	27	Pounds.....	44,600	1,652	.07	-3,063	114.18
Less duplicated areas.....	864						
Total cropped acreage.....	5,287		Total and average.....			749,982	141.85
		Areas.	Acres.	Farms.	Per cent of project.		
Irrigated, no crop:							
Nonbearing orchard.....	918	Irrigable area farms reported.....	7,544	401	74.7		
Young alfalfa.....	38	Irrigated area farms reported.....	6,402	401	63.4		
Miscellaneous.....	162	Under water right applications.....	5,021	361	49.7		
Less duplicated areas.....	3	Vested water rights.....	1,381	40	13.6		
Total irrigated acreage.....	6,402	Cropped area farms reported.....	5,287	401	51.3		

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, AUGUST 29, 1918.

1. **Supplemental construction agreements.**—Under the provisions of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly section 4 of the reclamation extension act of August 13, 1914 (38 Stat., 686), a majority of the water-right applicants and owners of the lands included in district No. 1 of the Okanogan project, Washington, have

made agreements providing for an increase in the cost of construction in the sum of \$12.50 per irrigable acre, and an additional annual charge covering the cost of operation and maintenance. This increased construction charge and additional operation and maintenance charge is for the purchase, installation, and operation and maintenance of necessary power and pumping machinery for pumping water to lands within the aforesaid district, said water to be pumped from Duck Lake during the time of water shortage in Conconully Reservoir.

2. **Ratification.**—The said agreements are hereby ratified and confirmed and the said increase in the construction charge of \$12.50 per irrigable acre, and an additional annual charge for operation and maintenance, are hereby made effective in accordance with the conditions of the said agreements and as herein specified.

3. **Lands affected.**—The lands in the district, all of which are subject to said increased cost of construction and additional yearly operation and maintenance charge, are described as follows: T. 34 N., R. 26 E., W. M.—Sec. 1, SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SE. $\frac{1}{4}$; sec. 12, E. $\frac{1}{4}$ NE. $\frac{1}{4}$ and SE. $\frac{1}{4}$ and S. $\frac{1}{4}$ SW. $\frac{1}{4}$; sec. 13, NW. $\frac{1}{4}$ NE. $\frac{1}{4}$, SE. $\frac{1}{4}$, SE. $\frac{1}{4}$, and 20 acres in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ T. 34 N., R. 27 E., W. M.—Sec. 6, lots 2, 3, 4, 6, and 7; sec. 7, lots 2, 3, 5, and 6; sec. 18, lot 4.

4. **Payment of increased construction charge.**—Such increased charge of \$12.50 per irrigable acre shall be added to the construction charge against the land in question and be paid in additional annual installments after the last of the installments of the present construction charge, being two annual installments of \$6.25 per irrigable acre each.

5. **Advance payment of increased construction charge permissible.**—Any water-right applicant in question may, at his option, pay in advance the whole or any part of the increased construction charge owing by him within any shorter period than that prescribed by this notice.

6. **Payment of additional operation and maintenance charge.**—The additional annual operation and maintenance cost on account of the power and pumping machinery herein provided for, beginning with the irrigation season of 1918, shall be added when ascertained, to the regular annual operation and maintenance charge and shall be payable at the same times and under the same terms and conditions.

E. C. BRADLEY,

Assistant to the Secretary of the Interior.

PUBLIC NOTICE, SEPTEMBER 10, 1918.

1. **Amendment to public notice of April 18, 1917.**—Section 6 of the public notice issued for the Okanogan project, Washington, dated April 18, 1917, is hereby amended to read as follows:

6. **General construction charge.**—The construction charge shall be \$95 per irrigable acre (less any amount heretofore paid per irrigable acre, upon any construction charge against the land in question, under any public notice heretofore issued for the project). For lands that were on or before August 13, 1914, subjected by contract or otherwise to the provisions of the reclamation law, said charge shall be payable in 10 equal annual installments, the first of which for lands of the first and second units shall become due and payable

on December 1, 1917, and for lands of the third unit on December following the date of water-right application, and subsequent installments in each case on December 1 of each year thereafter: *Provided, however,* That if water-right application subject to the provisions of the reclamation extension act, or an acceptance of the provisions of said act, be filed within six months from the date of this notice, said construction charge shall be payable in 20 annual installments commencing as aforesaid, the first four of which shall each be 2 per cent, the next 2 installments shall be each 4 per cent, and the next 14 each 6 per cent thereof. The aforesaid construction charge shall be decreased to the extent of any payments heretofore made thereon as above stated, and increased by any unpaid water rental or operation and maintenance charge heretofore authorized for the calendar year 1914, when such increase is requested by the water-right applicant.

E. C. BRADLEY,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, APRIL 26, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charge for the irrigation season of 1919 and thereafter until further notice, against all lands of the Okanogan project, Washington, under public notice, shall be a minimum charge of \$4 per irrigable acre, whether water is used thereon or not, which charge will permit the delivery of not to exceed 1 acre-foot of water per irrigable acre; for the first acre-foot per irrigable acre additional, the charge shall be \$1.50 per acre-foot; and for further quantities the charge shall be \$3 per acre-foot. The above charges are subject to the conditions that during the flood period of each year, or such time as water is wasting into the Okanogan River as determined by the project manager, each water user shall be charged with only two-thirds of the water delivered. All operation and maintenance charges will be due and payable each year, one-half thereof on January 15 and one-half thereof on July 1, following the irrigation season.

JOHN W. HALLOWELL,
Assistant to the Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Okanogan project, June 30, 1919.

Cash.....		\$468.63
Inventory of materials and supplies on hand.....		24,178.48
Accounts receivable:		
Current accounts receivable.....	\$29,830.52	
Construction water right charges unaccrued.....	777,883.96	
		807,714.48
Undelivered orders.....		18,187.01
Gross construction cost.....	947,028.73	
Less construction revenue earnings.....	54,183.37	
		892,845.36
Net construction cost.....		
Gross operation and maintenance cost.....	157,333.25	
Less operation and maintenance revenue earnings.....	57,582.46	
		99,750.79
Accounts payable.....		21,590.74
Contingent obligations.....		18,655.63
Collections and contracts of specific amounts for repayments to reclamation fund.....		883,521.55
Miscellaneous accruals.....		952.84
Capital investment:		
Disbursement, transfer and joint construction vouchers received.....	1,128,384.53	
Collection, transfer, refund and joint construction vouchers issued.....	209,960.55	
		918,423.98

Feature cost of Okanogan project to June 30, 1919.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Original construction:		
Examinations and surveys.....		\$4,603.27
Storage works—		
Salmon Lake Reservoir—		
Inlet canal.....	¹ \$6.00	1,993.00
Outlet works.....	¹ 10.00	6,568.52
Salmon Lake Dam.....		2,486.01
	¹ 16.00	11,047.53
Concomully Reservoir—		
Real estate.....	52.05	45,425.63
Clearing reservoir site.....	¹ 27.00	8,826.05
Concomully Dam.....	¹ 737.00	221,106.99
Spillway.....	¹ 124.40	37,646.39
Outlet works.....	¹ 75.00	24,234.19
	¹ 891.35	337,486.25
	¹ 907.35	348,533.78
Pumping for irrigation—		
Power plant No. 1.....		11,923.44
Power plant No. 2.....		13,931.42
Pumping plant.....		30,077.24
		55,932.10
Lateral system—		
Diversion weir in Salmon Creek.....	¹ 13.00	4,139.89
Main canal, main laterals and sublaterals.....	¹ 712.07	402,952.44
	¹ 725.07	407,092.33
Power system, transmission line.....		5,445.83
Farm units.....		1,889.92
Permanent improvements—		
Roads.....		1,105.96
Buildings.....	¹ 25.00	8,355.73
	¹ 25.00	9,461.71
Telephone system.....	¹ 19.00	6,679.10
Operation and maintenance during construction (water-rental basis).....		4,786.36
Total, original construction.....	¹ 1,676.42	844,374.40

¹Decrease.

Feature cost of Okanogan project to June 30, 1919—Continued.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Supplemental construction:		
Storage works—		
Salmon Lake Reservoir—		
Salmon Lake Dam.....	\$32,650.01	\$32,650.01
Outlet works and spillway.....	6,903.58	6,903.58
Outlet channel.....	46.59	46.59
Land purchases.....	8,200.00	8,200.00
	47,800.18	47,800.18
Conconully Reservoir—Conconully Dam enlargement.....	8,462.57	8,462.57
	56,262.75	56,262.75
Pumping for irrigation—Duck Lake pumping plant.....	10,092.72	10,092.72
Total, supplemental construction.....	66,355.47	66,355.47
Total cost of construction feature.....	64,679.05	910,729.87
Unadjusted clearing accounts.....		346.38
Balance in plant accounts.....		35,952.48
Gross construction cost to June 30, 1919.....	64,679.05	947,028.73
Less revenues earned during construction period—		
Rentals of buildings.....		224.00
Rentals of grazing and farming land.....	15.50	555.50
Rentals of irrigation water.....	1 51,672.58	53,343.08
Profit on hospital operations.....	260.71	541.94
Losses on operations, unclassified.....	2 333.22	2 481.15
	51,615.57	54,183.37
Net construction cost to June 30, 1919.....	13,063.48	892,845.36

¹ Adjustment of water rentals, 1912-1916, between "rentals of irrigation water—construction" and "rentals of irrigation water—operation and maintenance."

² Deduct.

Statement of costs by calendar years, Okanogan project.

	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
Year ending Dec. 31—					
1903.....	\$12,854.78				\$12,854.78
1904.....	5,037.06				5,037.06
1905.....	8,353.56				8,353.56
1906.....	64,175.40				64,175.40
1907.....	233,066.03				233,066.03
1908.....	106,856.55	\$4,138.88		\$4,138.88	110,995.43
1909.....	84,457.58	597.48	\$6,985.35	7,582.83	92,040.41
1910.....	41,424.39		10,236.20	10,236.20	51,660.59
1911.....	8,312.40		17,605.94	17,605.94	25,918.34
1912.....	48,857.05		13,385.93	13,385.93	62,242.98
1913.....	46,820.20		9,640.11	9,640.11	56,460.31
1914.....	86,932.97		9,780.32	9,780.32	96,713.29
1915.....	48,501.61		11,910.35	11,910.35	60,411.96
1916.....	23,636.76		13,584.69	13,584.69	37,221.45
1917.....	19,583.97		17,547.45	17,547.45	37,131.42
1918.....	20,114.20		32,297.72	32,297.72	52,411.92
Jan. 1 to June 30, 1919.....	47,009.00		13,462.79	13,462.79	60,471.79
Subtotal.....	905,993.51	4,736.36	156,436.85	161,173.21	1,067,166.72
Plant accounts, June 30, 1919.....	35,952.48				35,952.48
Undistributed clearing accounts June 30, 1919.....	346.38		896.40	896.40	1,242.78
Total.....	942,292.37	4,736.36	157,333.25	162,069.61	1,104,361.98

Statement of cost by fiscal years, Okanogan project.

	Construc- tion.	Operation and maintenance.			Total cost.
		During construc- tion.	Under public notice.	Total.	
Year ending June 30:					
1903.....	\$991.31				\$991.31
1904.....	14,549.91				14,549.91
1905.....	4,550.62				4,550.62
1906.....	13,739.41				13,739.41
1907.....	148,141.69				148,141.69
1908.....	195,503.16	\$2,703.12		\$2,703.12	198,206.28
1909.....	97,948.99	2,033.24	\$4,071.10	6,104.34	104,053.33
1910.....	80,212.40		8,588.62	8,588.62	88,801.02
1911.....	5,513.24		14,783.45	14,783.45	20,296.69
1912.....	28,937.77		15,158.17	15,158.17	44,095.94
1913.....	41,506.18		12,345.65	12,345.65	53,851.83
1914.....	56,180.31		5,502.35	5,502.35	64,682.66
1915.....	95,929.53		10,313.00	10,313.00	106,239.53
1916.....	28,775.90		13,534.42	13,534.42	42,310.32
1917.....	24,714.54		13,238.20	13,238.20	37,952.74
1918.....	4,122.50		21,143.87	21,143.87	25,266.37
1919.....	64,679.05		34,758.02	34,758.02	99,437.07
Subtotal.....	905,993.51	4,736.36	156,436.85	161,173.21	1,057,166.72
Plant accounts on June 30, 1919.....	35,952.48				35,952.48
Undistributed clearing accounts June 30, 1919.....	346.38		896.40	896.40	1,242.78
Total.....	942,292.37	4,736.36	157,333.25	162,069.61	1,104,361.98

Estimated cost of contemplated work, Okanogan project, during fiscal year 1920.

Features.	Subfeature.	Principal feature.
Storage system:		
Salmon Lake Reservoir.....	\$254,000	
Conconully Dam enlargement.....	20,000	\$274,000
Pumping system: Duck Lake plant.....		9,000
Operation and maintenance under public notice.....		32,000
Reimbursable accounts.....		5,000
Total.....		320,000

Comparison of operating costs and revenues for the calendar year 1918 and to Dec. 31, 1918.

Feature.	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works:						
Salmon Lake Reservoir.....	\$553.64	\$120.03	\$673.67	\$2,163.73	\$499.45	\$2,663.18
Conconully Reservoir.....	1,459.01	1,902.29	3,361.30	13,691.59	2,838.41	16,530.00
	2,012.65	2,022.32	4,034.97	15,855.32	3,337.86	19,193.18
Pumping for irrigation.....	11,449.01	6,462.58	17,911.59	12,661.54	7,016.14	19,677.68
Lateral system:						
Diversion Dam.....		153.77	153.77		248.33	248.33
Main Canal.....	1,282.02	1,753.13	3,035.15	7,132.94	10,514.55	17,647.49
South Side Canal.....	670.62	170.59	841.21	1,487.12	305.00	1,792.12
Upper main lateral.....	1,254.53	2,178.81	3,433.34	17,412.22	30,929.05	48,341.27
Lower main lateral.....	763.27	1,920.38	2,683.65	11,279.47	20,782.41	32,061.88
Diversion of private ditches.....		175.28	175.28		1,256.82	1,256.82
	3,970.44	6,351.96	10,322.40	37,311.75	64,038.16	101,347.91
Maintenance of permanent improvements.....		28.76	28.76		2,755.29	2,755.29
Total.....	17,432.10	14,865.62	32,297.72	65,828.61	77,145.45	142,974.06
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			16,526.04			\$71,842.26
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			37.98			41.34
Rental of land and buildings during operation period.....			415.80			2,445.47
Rental of irrigation water.....						55,496.18
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants (contra).....						¹ 354.03
Total.....			16,979.82			129,471.22
Difference (deficit).....			² 15,317.90			² 13,502.84

¹ Deduct.

² Deficit due to water shortage during season of 1918, necessitating installation and operation of pumping plants.

WASHINGTON, YAKIMA PROJECT.

R. K. TIFFANY, project manager, Yakima, Wash.

LOCATION.

Counties: Yakima, Benton, and Kittitas.

Townships: 8 to 22 N., Rs. 11 to 27 E., Willamette meridian.

Railroads: Northern Pacific; Chicago, Milwaukee & St. Paul; Union Pacific System; Yakima Valley Transportation Co.

Railroad stations and estimated population June 30, 1919: Grandview, 800; Sunnyside, 1,500; Outlook, 200; Granger, 500; Zillah, 500; Mabton, 600; Donald, 100; Benton City, 100; Prosser, 1,500; Ellensburg, 5,000; Thorp, 300; Union Gap, 200; Yakima, 22,000; Naches, 600; Wapato, 500; Toppenish, 1,700; Parker, 50; and Buena, 200.

WATER SUPPLY.

SUNNYSIDE UNIT.

Source of water supply: Yakima River and tributaries.

Area of drainage basin: 3,550 square miles.

Annual run-off in acre-feet of Yakima River at Union Gap: 3,550 square miles, 1897 to 1918, maximum, 4,680,000; minimum, 1,570,000; mean, 3,290,000.

TIETON UNIT.

Source of water supply: Tieton River and its tributaries.

Area of drainage basin: 247 square miles.

Annual run-off in acre-feet of Tieton River at canal headworks, 1908-1918, maximum, 484,000; minimum, 252,000; mean, 300,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to supply water, season of 1919: Sunnyside unit, 100,130 acres; Tieton unit, 32,000 acres.

Area under water-right applications and rental contracts, season of 1919: Sunnyside unit, 96,867 acres; Tieton unit, 30,880 acres.

Length of irrigating season: Sunnyside unit, April 1 to October 31, 214 days; Tieton unit, May 1 to October 1, 153 days.

Average elevation of irrigable area: 1,000 feet above sea level.

Rainfall on irrigable area: At Sunnyside, 1895 to 1918, average, 6.6 inches; 1918, 5.45 inches; at Tieton, 1911 to 1918, average, 8.50 inches; 1918, 5.40 inches.

Range of temperature on irrigable area: -21° to 110° F.

Character of soil of irrigable area: Sunnyside unit—on about three-fourths of the unit the soil is sandy loam or volcanic ash from 10 to 60 feet deep. The remainder is decomposed basalt, underlain by gravel or a combination of this with the above-named soils. Tieton unit—volcanic ash and decomposed basalt, underlain with gravel.

Principal products: Forage, hops, vegetables, and fruit; stock and dairy products.

Principal markets: Cities of the Northwest, British Columbia, and Alaska; fruit markets, the entire United States.

LANDS OPENED FOR IRRIGATION.

SUNNYSIDE UNIT.

Dates of public notices: November 18, 1908; March 2, 1909; April 18, April 19, May 2, 1910; March 15, 1911; February 29, May 31, 1912; June 16, June 23, October 2, 1913; March 10, April 11, and September 24, 1914; March 31, July 27, 1915; April 6, May 31, 1916; May 16, 1917; April 4, May 6, 1918; March 11, 1919.

Location of lands opened: Tps. 8 to 12 N., Rs. 19 to 27 E., Willamette meridian.

Duty of water: 3 acre-feet per acre per annum at the farm.

Limit of area of farm units: Public, 80 acres; private, 160 acres.

Building charge per acre of irrigable land: \$52 to \$64.

Annual operation and maintenance charge: \$1 per acre vested water rights; for public notice lands a minimum of \$2, which will permit delivery of not more than the following amounts per irrigable acre: To lands of class A, 2 acre-feet; to lands of class B, 2½ acre-feet; to lands of class C, 3 acre-feet. For additional water above the foregoing amounts, the rate shall be 50 cents per acre-foot. Provided, that for newly reclaimed lands no charge will be made for water actually needed in excess of the amount covered by a charge of \$2 per irrigable acre at the said rates.

TIETON UNIT.

Dates of public notices and orders: November 7, 1910; March 8, April 14, 1911; January 24, February 21, April 18, May 10, 1912; March 21, April 25, June 16, 1913; March 4, September 24, 1914; March 9, March 20, October 30, 1915; March 16, April 3, 1916; March 17, 1917; April 12, November 15, 1918; March 11, 1919.

Location of lands opened: Tps. 12 to 15 N., Rs. 16 to 18 E., Willamette meridian.

Duty of water: That quantity of water which shall be beneficially used for the irrigation of the lands and in no case exceed the share proportionate to irrigable acreage of water supply actually available. The average use is about 2.25 acre-feet per acre delivered at the farm.

Limit of area of farm units: Public, 40 acres; private, 160 acres.

Building charge per acre of irrigable land: \$93 plus \$11.63 supplemental construction.

Annual operation and maintenance charge: For all water delivered between June 1 and August 31, inclusive, \$1 per acre-foot; for all water delivered at other times during the irrigation season, 60 cents per acre-foot; with a minimum of \$1.25 per irrigable acre whether water is used or not, which minimum amount when paid is credited upon the account for water delivered at the above acre-foot rates.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys in 1903.

Report of Board of Engineers recommending construction October 16, 1905.

Construction of Sunnyside and Tieton units authorized by Secretary December 12, 1905; Wapato unit, June 16, 1906.

Sunnyside Canal purchased June 23, 1906.

First irrigation by Reclamation Service, Sunnyside unit, season of 1907.

Tieton diversion dam completed December, 1908.

Tieton Main Canal completed in 1909.

Bumping Lake Dam completed in 1910.

First irrigation by Reclamation Service, Tieton unit, season of 1911.

Tieton unit completed winter of 1911-12.

Kachees Dam completed fall of 1912.

Warren Act contract with Kittitas reclamation district executed by Secretary of Interior January 18, 1913.

Contract with Sunnyside irrigation district signed October 6, 1914.

Contract with Snipes Mountain irrigation district signed November 16, 1914.

Contract with Outlook irrigation district signed November 23, 1914.

Construction for Sunnyside irrigation district (Benton extension) completed April, 1916.

Construction for Outlook irrigation district completed June 1, 1916.

Construction for Snipes Mountain irrigation district completed June 30, 1916.

Contract with Grandview irrigation district signed August 4, 1916. Construction completed July 31, 1917. Construction, gravity system, completed June 30, 1917.

Contract with Prosser irrigation district signed December 1, 1917; construction completed June 30, 1919.

Contract with Yakima-Tieton irrigation district authorizing expenditures under supplemental construction signed August 7, 1918.

Enlargement of Tieton Main Canal completed December, 1918.

Per cent completed June 30, 1919: Storage unit, 42 per cent; Sunnyside unit, 95 per cent; Tieton unit, 99 per cent.

IRRIGATION PLAN.

The irrigation plan of the Yakima project provides for the storage of flood waters of the Yakima River and its tributaries in Kachees, Keechelus, Clealum, and Bumping Lakes, and in a reservoir at McAlister Meadows; the diversion of water from the Yakima River for the irrigation of 62,000 acres of land on both sides of the river in the vicinity of Ellensburg, comprising the Kittitas unit; the diversion of water from the east bank of the Yakima River near Parker for the irrigation of 110,828 acres of land by means of the old Sunnyside Canal, as improved and extended by the Reclamation Service, comprising the Sunnyside unit; the diversion of water from the Tieton River below McAlister Meadows (a reservoir being provided on the headwaters of this stream to regulate diurnal flow) for the irrigation of 32,000 acres of land lying between the Naches River and Ahtanum Creek, in the vicinity of Yakima, comprising the Tieton unit; and the diversion of water from the west bank of the Yakima River near Parker for the irrigation by means of the canal system of the Yakima Indian Reservation, improved and extended, of 106,000 acres of land by gravity, and 14,000 acres of land by pumping with power developed at drops in the canals, comprising the Wapato unit. The plan also provides for the development of power from drops in the main canals and laterals of the Sunnyside and Tieton units to be used for pumping irrigation water and for other purposes. The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The following features of the above plan have been completed: Sunnyside unit: Diversion dam, enlargement of main canal, Sulphur Creek wasteway, and the distribution system, Benton extension (Sunnyside irrigation district), Snipes Mountain irrigation district (pumping unit), Outlook irrigation district, (pumping unit), Grandview irrigation district (pumping unit), Prosser irrigation district (pumping unit); Tieton unit: Bumping Lake storage dam, Clear Creek Dam, Tieton River diversion dam, main canal, and distribution system.

Minor construction work on Kachees dam and clearing of the reservoir area at Lake Keechelus have been in progress. The outlet tunnel at Tieton Reservoir has been completed.

Features for future construction are the Granger siphon, Mabton pumping plant, Clealum and Tieton Reservoirs. Surveys for new canal systems to serve from 150,000 to 200,000 acres of first-class land are under way. The lands to be irrigated lie above existing canals in the Naches, Selah, Moxee, Sunnyside, and Cold Creek Valleys north of the Yakima River, and a body of land between Kiona and Kennewick south of the Yakima River.

SUMMARY OF GENERAL DATA FOR YAKIMA PROJECT TO END OF FISCAL YEAR 1919.

	Sunnyside unit.	Tieton unit.	Storage unit.	Total.
Areas:				
Irrigable acreage when complete.....	110,828	32,000	.....	142,828
Public land entered to June 30, 1919.....	2,627	2,052	.....	4,679
State land June 30, 1919.....	1,153	2,016	.....	3,174
Railroad land June 30, 1919.....	.....	220	.....	220
Private land June 30, 1919.....	107,043	27,702	.....	134,745
Acreage service could have supplied in season 1918.....	98,537	31,000	.....	129,537
Estimated acreage service can supply season 1919.....	100,130	32,000	.....	132,130
Estimated acreage service can supply season 1920.....	105,000	32,000	.....	137,000
Acreage irrigated season 1918.....	84,650	26,400	.....	111,050
Acreage cropped under irrigation season 1918.....	70,465	25,845	.....	96,310
Crops:				
Value of irrigated crops, season 1918.....	\$7,213,392.00	\$2,516,251.00	.....	\$9,729,643.00
Value of irrigated crops per acre cropped.....	\$102.36	\$97.36	.....	\$101.02
Finances:				
Net construction cost to June 30, 1919.....	\$3,339,421.44	\$3,362,369.23	\$3,598,633.96	\$10,300,424.63
Per cent completed on June 30, 1919.....	95	99	42	.....
Appropriated for fiscal year 1920.....	.....	.....	.....	\$353,000.00
Estimated per cent complete by June 30, 1920.....	95	99	42	.....

¹ Net construction costs above, \$10,300,424.63; add net construction cost high-line investigations, \$114,790.57; total net construction cost, Yakima project, June 30, 1919, \$10,415,215.17.

Summary of general data for Yakima project to end of fiscal year 1919—Continued.

	Sunnyside unit.	Tieton unit.	Storage unit.	Total.
Proposed appropriation for fiscal year 1921.....				\$351,009
Estimated per cent complete by June 30, 1921.....	95	99	43	
Announced construction charges per acre—				
Original construction.....	\$52 to \$64	\$93.00		
Supplemental.....		\$11.63		
Appropriation fiscal year 1919.....				\$645,000.00
Balance 1918 appropriation.....				25,066.94
Collections and transfers.....				126,408.80
Increased compensation.....				32,414.87
				828,890.61
Expenditures chargeable to 1919 appropriation—				
Disbursements.....				552,355.62
Transfers.....				51,769.34
Current liabilities.....				101,789.18
Contingent liabilities.....				5,637.25
Total.....				711,551.39
Unencumbered balance on July 1, 1919.....				117,339.22
Repayments:				
Value of construction water-right contracts.....	\$3,481,891.98	\$2,917,495.33	\$668,202.00	7,067,589.31
Construction charges—				
Accrued to June 30, 1919.....	914,307.76	493,490.31	515,504.40	1,913,302.47
Collected to June 30, 1919.....	893,118.15	461,074.72	514,804.40	1,868,997.27
Uncollected on June 30, 1919.....	21,189.61	22,415.59	700.00	44,305.20
Operation and maintenance charges—				
Accrued to June 30, 1919.....	855,933.34	310,229.41	31,930.13	1,198,092.88
Collected to June 30, 1919.....	834,489.43	290,266.49	31,904.08	1,156,660.00
Uncollected on June 30, 1919.....	21,443.91	19,962.92	26.05	41,432.88
Water rental charges—				
Accrued to June 30, 1919.....	46,441.05	6,216.50	21,792.50	74,450.05
Collected to June 30, 1919.....	46,279.73	6,216.50	21,194.50	73,690.73
Uncollected on June 30, 1919.....	161.32		598.00	759.32
Power charges—				
Accrued to June 30, 1919.....	1,869.20		1,766.13	3,635.33
Collected to June 30, 1919.....	1,869.20		1,766.13	3,635.33
Drainage:				
Estimated acreage damaged by seepage to June 30, 1919.....	10,000	100		10,100
Miles of drain built to June 30, 1919—				
Open.....	70	8		78
Closed.....	50	1		51
Estimated acreage protected by drains to June 30, 1919.....	42,000	1,350		43,350
Cost of drainage works to June 30, 1919—				
Drainage districts.....	\$923,243.00			
Government investigations.....	\$11,418.80			\$934,661.80

STORAGE UNIT.

CONSTRUCTION DURING FISCAL YEAR.

Kachess Dam.—No construction was done at the dam site, but operation and maintenance of the structures were continued throughout the year.

Clealum Crib Dam.—No construction was done during the year, but operation and maintenance of the structure were continued.

Keechelus Dam.—Some work was done cleaning out the spillway channel, excavating the spillway approach channel, and trimming

the top of the dam. The cofferdam was removed from the intake channel to the outlet works; and a large portion of the channel was excavated to final grade. The gate-tower sump was pumped out and the outlet works inspected. Clearing of the reservoir area was continued. Approximately 200 acres were cleared during the year.

Tieton Dam.—No work was done at this dam other than the care of the equipment and camp and the decking of some logs in the reservoir area.

Clear Creek Dam.—This dam was raised 21 feet to its final height; and the spillway completed.

BOARD MEETINGS.

Date.	Topic.	Personnel.
July 9-10, 1918.....	Location and type of Tieton Dam.	A. P. Davis, W. L. Marshall, D. C. Henny, F. E. Weymouth, Chas. H. Swigart, and C. E. Crownover.

SUNNYSIDE UNIT.

CONSTRUCTION DURING FISCAL YEAR.

The construction work consisted of the completion of the pumping and power plants for the Snipes Mountain, Outlook, and Grandview irrigation districts, and the continuation of work on the pumping plants and distribution system for the Prosser irrigation district.

For Snipes Mountain irrigation district redesigned parts were installed in the small unit of the Snipes plant and this unit as modified was tested on March 28, 1919, and found to be satisfactory.

In the Outlook irrigation district, laterals in the gravity system were enlarged and extended in order to provide additional power water for the pumping plant. Two hundred and forty-one acres, excluded from the district because the owner refused to execute trust deeds as required by the department, had changed hands and on petition of the new owner were again taken into the district and contract with the district revised to include it. The pumping plant was originally designed and built to serve this area, the only new work during the year being the installation of necessary deliveries.

Work for the Grandview irrigation district consisted of installation of minor equipment, such as settling tanks, etc., in the Rocky Ford power plant, and the enlargement and extension of Rocky Ford lateral in order to provide additional power water to operate the Rocky Ford power plant to capacity.

Work for the Prosser irrigation district consisted of completion of the pumping plants and distribution system, except lining the main laterals with concrete. From midsummer, 1918, until the close of the construction camp in October, 1918, the work accomplished on the Prosser plants comprised the construction of the two power houses and the completion of the penstocks and discharge pipes. On the distribution system all excavation was completed and pipe lines installed. After the closing of the camp a small crew continued the work of installation of small structures throughout the distribution system until weather conditions made it necessary to discontinue all work.

The machinery for the pumping plants was received and installed during March and April. On the Spring Creek unit the pipe lines and laterals were placed in service for delivery of water May 1. On the Prosser unit the priming of the pipe lines and laterals was accomplished the fore part of May and the pumping plant was ready for service May 16, although delivery of water was not started until May 19. Both units were tested and accepted during May. Coincident with the installation of the machinery a small crew was occupied with the completion of the distribution system. All construction work for the district was completed by June 30, except lining the main laterals with concrete.

DRAINAGE.

The drainage system on the Sunnyside unit has been constructed and is operated and maintained by drainage districts in accordance with the State law. Since 1912, 30 drains with a length of 132.5 miles, have been completed or are under construction. Of the 132.5 miles of drains, 78.5 are open ditch and 54 miles are covered tile drains from 4 to 24 inches in diameter. The total excavation for drains built or under construction approximates 1,626,000 cubic yards, at a cost of \$923,243, and affects 42,295 acres of land.

Of the 30 drains built, 16, serving 21,875 acres, discharge into Sulphur Creek wasteway, which serves the twofold purpose of a relief for the main canal and the main artery of the drainage system for the country between Outlook and Grandview.

OPERATION AND MAINTENANCE.

The operation of the Sunnyside Canal and distribution system from July 1, 1918, to the close of the 1918 irrigation season, October 31, was without incident other than the usual routine. After the heavy demand for water in the early spring, the demand during the remainder of the season was steady and continuous. Excess deliveries were allowed in many cases where soil or crop condition warranted. The maximum quantity diverted from the Yakima River was 1,235 second-feet on July 7. There was no appreciable slackening of the demand for water until the latter part of August. After that, however, the demand gradually lessened until the close of the irrigation season. For the season of 1918 the service was prepared to furnish water to 98,537 acres; 93,902 acres were under water-right application or contract and delivery of water was made to 84,650 acres.

The operating season of 1919 opened March 12, when approximately 175 second-feet were turned into the main canal for priming. By April 10 diversion from the river had been increased to approximately 600 second-feet, and water was being delivered to the several irrigation districts in accordance with the demand. On the gravity system all demand was being cared for except for lands under laterals which were being reconstructed as local improvement districts and under the Rocky Ford and Ryder Canals where, because of enlargement of these canals, some delay was had in initiating water service. By April 20 full service was furnished under the Rocky Ford and Ryder Canals and by May 1 under all laterals where there had been delay on account of reconstruction. During April there were several breaks and leaks in the branch canals and larger laterals, none of

which, however, resulted in material damage or serious interruption of water service. The demand for water increased rapidly until May 1, when the diversion was approximately 1,200 second-feet. From that date until June 30 it varied from 1,150 second-feet to a maximum of 1,230 second-feet on June 28.

The maintenance work, done mostly in the nonirrigation season, consisted of the usual work of removal of silt, prevention and correction of erosion, repair and replacement of structures, and upkeep of telephone system, buildings, and grounds. In addition, 1,100 lineal feet of 26-inch diameter wood stave pipe were replaced with 27-inch diameter vitrified clay pipe; and five wooden flumes of the usual box type, on the Mabton Canal, a total length of 744 lineal feet, were replaced by an equal number of flumes of the semicircular wood-stave type. During the year, in addition to the replacement of many wood structures in the distribution system, there were constructed 40 new wooden delivery structures, 85 concrete delivery structures, and 16 concrete and steel turnouts from main and branch canals.

Historical review, Sunnyside unit, Yakima project.

Item.	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water.....	81,807	89,253	97,176	98,537	100,130
Acreage irrigated.....	67,000	71,400	78,000	84,050	87,000
Number of farms irrigated.....	2,450	2,553	2,682	2,740	2,800
Miles of canal operated.....	528	572	590	597	605
Water diverted (acre-feet).....	314,058	276,210	353,287	413,829	417,943
Water diverted to land (acre-feet).....	208,397	180,418	234,662	287,385	288,031
Per acre of land irrigated (acre-feet).....	3.085	2.527	3.008	3.496	3.368

¹ Shortage in supply of water available in the river, Aug. 8 to Oct. 23, 1916.

SETTLEMENT AND DEVELOPMENT.

The good progress made in 1917 continued during the calendar year 1918 and the first half of 1919. The high prices received for farm products have resulted in a brisk movement of land, both raw and improved. One of the most satisfactory results has been the decrease in tenant farming and the increase in farms operated by owners. From 1915 to 1917 the number of farms operated by owners, or in a few cases by resident managers, decreased from 1,910 to 1,744, but since 1917 there has been a steady increase to 1,983. The number operated by tenants increased from 540 to 938 in 1917, but decreased to 797 in the present year. The ability to secure Federal farm loans has made it possible for many tenants to purchase farms for themselves, and nonresident owners, many of whom have been willing but unable to sell for several years past, are now disposing of their property. The tendency toward stock raising and general farming continues, and with it the tendency to larger average holdings.

Although there is no increase in the number of public schools, there have been many additions to the present buildings. Business men report that business has been better than ever before, with more cash purchases and fewer bad debts. The automobile as a means of travel is the rule rather than the exception among farmers, and considerable numbers of trucks and tractors are in evidence.

Work was initiated on a road-building program for good hard-surfaced roads on all main highways and principal feeders to shipping points. There has been a large amount of building in the towns, the most noticeable of which is in the warehouse districts. This is particularly noticeable in Grandview, Zillah, and Buena.

Settlement data, Sunnyside unit, Yakima project.

Items.	1915	1916	1917	1918	1919
Total number of farms on project.....	2,450	2,553	2,682	2,740	2,780
Population of.....	7,270	7,844	8,000	8,255	8,744
Number of irrigated farms.....	2,450	2,553	2,682	2,740	2,780
Operated by owners or managers.....	1,910	1,898	1,744	1,942	1,983
Operated by tenants.....	540	655	938	798	797
Population of.....	7,270	7,844	8,000	8,255	8,744
Number of towns.....	13	13	13	13	13
Population of.....	5,460	5,268	5,350	5,550	5,975
Total population of towns and on farms...	12,730	13,112	13,350	13,805	14,719
Number of public schools.....	34	34	35	37	37
Number of churches.....	30	30	30	30	30
Number of banks.....	9	9	9	9	10
Total capital stock.....	\$255,000	\$309,573	\$245,000	\$277,500	\$275,000
Total amount of deposits.....	\$1,028,679	\$1,112,296	\$1,896,341	\$2,349,702	\$2,642,851
Total number of depositors.....	5,848	5,674	6,640	7,375	7,936

PRINCIPAL CROPS.

The season of 1918 was generally unfavorable for crops. Although, on the whole, the winter of 1917-18 was comparatively mild, killing frosts occurred as late as May 8. Because of the late frosts, together with frequent winds throughout the spring and entire summer, plant growth of all kinds was retarded and the crop of berries and other soft fruits was greatly reduced, as compared with previous years. No unusually severe storms occurred during the year and, except for an excessive amount of high, and sometimes very warm, winds throughout the spring and summer, the weather was about normal. Although the maximum temperature of 107° on July 17 was the highest experienced in several years, there was not the long period of extreme heat, such as was had in July, 1917. The minimum temperature was 8°, which was not so low as usual. The total precipitation for the year was 5.45 inches, somewhat below the average.

The mild winter and absence of snow, except for a light fall at intervals, permitted the grazing of stock throughout almost the entire winter. The mild weather also permitted the ranchers to accomplish a considerable amount of work during the winter and early spring, which helped materially to overcome the general scarcity of labor. The fall was also unusually mild and this condition not only permitted a full ripening of all crops, but also prolonged the harvest season and in a great measure relieved the labor situation. Because of the very favorable weather conditions, maintenance work was also carried on to advantage throughout the entire year.

In the early spring the prospect for a bumper crop was excellent, but late frosts, followed by a period of hot days and cold nights throughout the latter part of May, destroyed this prospect and resulted in a diminished yield of all crops, almost amounting to a failure in the case of sugar beets. During this period the thermometer repeatedly varied 50° or more within 24 hours and the result

was partial blight of most root crops and a plague of aphid on alfalfa and fruits. Fortunately, the rather low yields were largely counter-balanced by unusually good prices when the crops were harvested and the net result was in general a very prosperous year for the farmer.

Alfalfa continues to be the largest crop in acreage grown. The average yield of 4.3 tons per acre was the lowest for several years, but the average price of \$22 a ton, giving a return of \$94.60 per acre, is the highest of record and by reason of this return alfalfa continues the staple crop for the average farmer. The total increase of area in alfalfa was 5,341 acres, or 17 per cent as compared with 1917. The area planted to hay other than alfalfa shows an increase of 11 per cent, while the area in pasture remains approximately the same. The area planted to potatoes shows a marked decrease as compared with the preceding year, this decrease amounting to 1,863 acres, or approximately 35 per cent of the 1917 area. The reason for this was the comparatively low prices received for the 1917 crop, particularly for that portion which was sold in the spring of 1918. Corn shows approximately a 10 per cent increase in area planted, although not quite so much of it went into the silo, while the average return of \$70 per acre was somewhat above normal. On the greater portion of the project there were no soft fruits other than pears, which proved not only an exception as to producing generally throughout the project, but in contrast to all other fruit produced a somewhat better than normal yield. The yield of apples was spotted and in many places where there was a fair crop a large share of the fruit was culled at harvest time because of pests.

In 1918 a large acreage of sugar beets was planted on the Sunnyside unit, but a severe attack of blight entirely destroyed many fields and reduced the average yield on the 4,074 acres actually harvested to 5 tons per acre as compared with the average for 1917 of 10 tons. The planting of beets in 1919 is about 2,700 acres and their condition on June 30 was good. Work on the Sunnyside and Toppenish factories, which was stopped in the summer of 1918 due to blight and the war demand for labor, has been resumed and both will be completed within the present year.

The total crop return of \$7,213,392 is \$792,841 less than the total return for 1917. The decrease is more than accounted for in the decreased return from potatoes and apples, which, together, show an approximate decreased return of \$1,250,000. The average return per acre cropped for 1918 is \$102.36 as compared with \$121.67 for 1917. The stock census for 1918 shows that the tendency to reduce the number of live stock on the project, so strongly prevalent in 1917, has been arrested except for cattle. Horses, hogs, and sheep show an increase both in number and value, while cattle show a decreased number accompanied by an increased value. The returns as to silos indicate too that the dairy industry for the present is not expanding, while the increase in the number of automobiles continues to show the prosperity of the average farmer.

Crop report Yakima project, Sunnyside unit, 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa.....	36,516	Ton.....	157,020	4.3	\$22.00	\$3,454,440	\$94.60	
Apples.....	10,634	Pound.....	34,039,050	3,200	.03	1,021,172	96.00	
Barley.....	547	Bushel.....	15,440	28	1.50	23,160	42.00	
Beans.....	1,371	do.....	21,936	16	3.60	78,970	57.60	
Beets, sugar.....	4,074	Ton.....	20,370	5	10.00	203,700	50.00	
Corn.....	6,301	Bushel.....	315,060	50	1.40	441,070	70.00	
Corn, ensilage.....	786	Ton.....	8,646	11	9.00	77,814	99.00	
Corn, fodder.....	889	do.....	4,445	5	6.00	26,670	30.00	
Fruits, small.....	286	Acre.....				87,200	200.00	
Garden.....	1,299	do.....				194,850	150.00	
Hay, other than alfalfa.....	1,575	Ton.....	4,726	3	22.00	103,950	66.00	
Hops.....	121	Pound.....	208,800	1,725	.12	25,056	207.00	
Melons.....	98	Acre.....			200.00	19,600	200.00	
Oats.....	130	Bushel.....	5,200	40	1.00	5,200	40.00	
Pasture.....	4,067	Acre.....				101,675	25.00	
Peaches.....	811	Pound.....	1,535,620	1,893	.04	61,425	75.70	
Pears.....	1,528	do.....	11,980,500	7,840	.035	419,318	274.40	
Prunes.....	275	do.....	3,256,130	11,841	.045	146,526	532.80	
Potatoes.....	3,551	Bushel.....	748,584	211	.80	598,868	168.60	
Vetch seed.....	130	Pound.....	44,800	344	.16	7,168	55.00	
Wheat.....	3,439	Bushel.....	72,780	20	2.00	145,560	40.00	
Less duplicated areas.....	8,163							
Total cropped acreage.....	70,465	Total and average.....					7,213,392	102.36
			Area.	Acres.	Number of farms.	Per cent of project.		
Irrigated, no crop:								
Young orchard.....	432	Total irrigable area farms reported..		84,650	2,730	76.38		
Young alfalfa.....	3,082	Total irrigated area farms reported..		84,650	2,730	76.38		
House and corral area.....	2,775	Under water right applications.....		28,850	900	26.08		
Townsite area.....	1,960	Under rental contracts.....		55,800	1,820	50.35		
Irrigated without crop.....	7,577	Total cropped area farms reported....		70,465	2,730	68.58		
Less duplicated areas.....	1,631							
Total irrigated.....	84,650							

TIETON UNIT.**CONSTRUCTION DURING FISCAL YEAR.**

All construction work during the year was done under supplemental construction in accordance with the terms of a contract with the Tieton irrigation district dated August 7, 1918.

Canal enlargement.—The program of enlargement on the Tieton Canal, which was begun in 1916 and continued in 1917, was completed in the fall of 1918. The work consisted of raising the sides of the semicircular section 1 foot and replacing the original concrete crossbars with steel bar or channel crossbars spaced from 4 to 6 feet. The capacity of the section was thereby increased from 300 second-feet to about 350 second-feet. The work was done by Government forces during the months of August to December, inclusive, and covered 254 stations, involving the placing of 874 cubic yards of concrete.

In connection with the enlargement of the open channel, a revised transition 52 feet in length was constructed at the entrance to Columnar Tunnel for the purpose of bringing the tunnel capacity up to that of the open section.

Patrol house.—A patrol site was secured on the upper end of the Ahtanum Ridge near the diversion point for lateral S, and a new

house was erected thereon during the winter months. A permanent location in this section affords better regulation under this lateral and attracts a more stable class of employees, thus resulting in improved service to the water users.

Cowiche diversion.—For the purpose of obtaining a supplemental flow of water, a diversion dam and a short canal were constructed for diverting 25 second-feet from the South Fork of the Cowiche Creek. The work was done with Government forces during the months of February and March.

OPERATION AND MAINTENANCE.

From July 1, 1918, to the close of the 1918 irrigation season water service under the Tieton Canal was practically without interruption and the supply was adequate to meet the average irrigation needs. The increased delivery of about 15 second-feet, which was made available through the enlargement in the fall of 1917, coupled with favorable weather conditions, did much to relieve the situation. In order to permit the concrete work on the canal enlargement to begin as early as possible, the irrigation season was closed on September 27, at a time when the supply of stored water in Clear Creek and Bumping Lake Reservoirs was practically exhausted.

For the irrigation season of 1919 a small quantity of water was first diverted from the South Fork of the Cowiche Creek on April 1. This diversion was made largely for the purpose of supplying the demand for cistern and spray water, which service was withheld during the month of March, contrary to the usual custom, in order to avoid interruption in the spring maintenance work. Water was first turned into the canal on April 13, and by the end of the month the diversion was increased to the maximum capacity for the previous season of 305 second-feet.

The present maximum capacity of 330 second-feet at the two lower tunnels, where no change in the original transitions has yet been made, was reached early in May. The additional quantity of about 25 second-feet obtained through the 1918 enlargement, together with that made available at the South Fork diversion, provided an ample supply of water during the last half of the fiscal year for the irrigation of about 27,500 acres of land which were receiving water. This represents about 86 per cent of the irrigable land under the project.

The plan of delivery on the Tieton unit provides two definite rotation schedules to suit the varying soil conditions. About 15,000 acres of the more shallow soil, peculiar to the south half of the project, are served on a schedule of 7 days on and 7 days off, and the remainder on a schedule of 7 days on and 14 days off. The larger quantity of water available during the last half of the fiscal year permitted the normal delivery to be increased, on the basis of a continuous flow, from 1 second-foot to 140 acres to 1 second-foot to 126 acres.

The maintenance work was done, for the most part, during the nonirrigation season and consisted of cleaning of both weeds and silt from canals and laterals in order to carry the desired quantities of water, repairs to steel flumes on main laterals, repair and renewal of small wooden structures mostly on the sublateral system, maintenance of houses and grounds, and the upkeep of 131 miles of telephone line.

The program of fall maintenance work contemplated only the cleaning of the main laterals and the renewal of some of the more important structures. Weather conditions were exceptionally favorable throughout the fall for performing all classes of such work, but at the close of the year the program was only about 75 per cent completed owing to the labor shortage and to the heavy demand for teams. Consequently there was a large amount of important work remaining to be done in the spring of 1919, in addition to the usual cleaning of the sublaterals and repair of small concrete pipe lines and wooden flumes.

Historical review, Tieton unit, Yakima project.

Item.	1914	1915	1916	1917	1918	¹ 1919
Acreage for which service was prepared to supply water.....	34,000	34,000	30,000	31,000	31,000	32,000
Acreage irrigated.....	20,600	22,000	23,000	25,400	26,400	27,500
Miles of canal operated.....	335	335	335	335	335	335
Water diverted (acre-feet).....	67,790	62,000	74,936	80,377	90,280	98,000
Water served to land (acre-feet).....	43,069	40,376	49,412	57,318	64,068	69,000
Per acre of land irrigated (acre-feet).....	2.09	1.83	2.15	2.26	2.43	2.5

¹ Estimated.

SETTLEMENT AND DEVELOPMENT.

Settlement on the Tieton unit has increased more rapidly during the past year than at any time in the last five years, due no doubt in large part to the relatively high prices received for farm products of all kinds. The increase of population on the farms from November, 1917, to November, 1918, was 719, or approximately 33 per cent. The number of owners on farms has steadily increased during the past five years from 486 to 820. The number of tenants increased from 414 in 1914 to 500 in 1916, but since then has decreased to 460 in 1918, and it is believed that sales made during the past spring will show a still further reduction in tenant farming, a thing very much to be desired. With the increase in percentage of farms operated by owners there is noticeable improvement in farm methods and in general crop results.

In the new town of Tieton, at the terminus of the Cowiche branch of the Northern Pacific railroad, many improvements have been made, including store buildings and warehouses necessary to handle the rapidly growing trade of that vicinity. Other large warehouses have been built on this branch, also on branches of the Yakima Valley Transportation Co. which tap the Nob Hill and Wide Hollow districts west of Yakima.

Many new homes, farm buildings, silos, etc., are in evidence. It has been impossible for road building to keep pace with the demands but many road improvements have been made and others are planned for the near future. It is interesting to note that the reported value of automobiles on the project December 31, 1918, is in excess of the total value of all other farm equipment on the project at that date.

Settlement Data, Tieton unit, Yakima project.

Item.	1915	1916	1917	1918	1919
Total number of farms.....	1,200	1,300	1,400	1,400	1,480
Population.....	2,100	2,250	2,150	2,150	2,850
Number of irrigated farms.....	1,300	1,300	1,400	1,400	1,400
Population.....	2,100	2,250	2,150	2,150	2,880
Number of towns, etc.....	7	7	7	7	8
Population.....	19,000	20,000	20,500	21,850	23,000
Total population.....	21,100	22,250	22,650	24,000	25,880
Number of public schools.....	10	10	10	10	10
Number of churches.....	3	3	3	3	3

PRINCIPAL CROPS.

The principal crops grown are hay, fruits, grain, vegetables, hops, and sugar beets. Alfalfa, which covers nearly 50 per cent of the lands under the project, continues to be the largest crop in point of acreage. The average yield of 3.3 tons per acre was slightly above the average. For the first time in the history of the project the apple crop returned a larger gross value to the grower than alfalfa hay; and fruits, as a whole, brought 41 per cent of the total return. There is a substantial increase in the acreage sowed to grain, especially wheat, the yields being about the average. Corn and potatoes show a decline in area of 50 and 75 per cent, respectively, since 1914, with slight increases in yield. The acreage in sugar beets and beans was less than in 1917, being about 1 per cent each, of the gross area cropped, but the total tonnage was greater, owing to the increased yields per acre.

Market conditions were better and the yields per acre higher for all crops, with the possible exception of small grain, than for any previous season. The average return per acre was \$97.36, the average farm return was nearly \$2,000, and the total return of \$2,516,251 was more than double that for the season of 1916. The high price of hay, coupled with the large yield and good prices for all kinds of fruit, was in the main responsible for this larger return. The maximum return per acre of \$389.40 was realized on 25 acres of onions, 88 acres of small fruit coming second at \$296.20 per acre.

The high price received for all farm products, including live stock, resulted in a greater degree of general prosperity than has ever existed on the project. In spite of the cold, backward spring, prospects on June 30 for satisfactory crops and prices are even better than a year ago.

Crop report, Tieton unit, Yakima project, Washington, year of 1918.

Crop.	Area (acres).	Unit of Yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	12,218	Ton.....	40,862	3.3	\$20.00	\$817,240	\$66.90
Apples.....	6,600	Pound.....	33,339,150	5,050	.025	833,480	126.30
Barley.....	886	Bushel.....	21,500	24.3	1.25	26,875	30.32
Beans.....	667	do.....	13,182	19.8	3.60	47,455	71.15
Beets, sugar.....	235	Ton.....	2,250	9.6	10.00	22,500	95.75
Clover hay.....	216	do.....	370	1.7	25.00	9,250	42.80
Corn.....	728	Bushel.....	31,274	43	1.40	43,784	60.15
Corn, ensilage.....	200	Ton.....	3,112	15.5	9.00	28,008	140.05
Corn, fodder.....	170	do.....	949	5.6	5.00	4,745	27.90
Fruits, small.....	88	Pound.....	260,270	2,960	.10	26,067	296.20
Garden.....	210	Acre.....	210		125.00	26,250	125.00
Hay, except above.....	277	Ton.....	406	1.5	20.00	8,120	29.30
Hops.....	306	Pound.....	370,000	1,210	.12	44,400	145.10
Oats.....	306	Bushel.....	10,624	34.8	.80	8,499	27.75
Onions.....	25	do.....	4,980	199	2.00	9,960	398.40
Pasture.....	1,082	Acre.....	1,082		25.00	27,050	25.00
Peaches.....	448	Pound.....	2,590,100	5,760	.0275	70,951	158.40
Pears.....	1,276	do.....	4,433,050	3,475	.0225	99,744	78.15
Popcorn.....	31	do.....	62,000	2,000	.10	6,200	200.00
Potatoes.....	1,060	Bushel.....	195,866	184	.80	156,693	147.80
Wheat.....	4,681	do.....	99,490	21.2	2.00	198,980	42.50
Less duplicated areas.....	5,865						
Total cropped acreage.	25,845	Total and average.....				2,516,251	97.36
		Areas.		Acres.	Farms.	Per cent of project.	
Irrigated, no crop:		Total irrigable area farms reported..		30,285	1,280	96.9	
Young orchard.....	745	Total irrigated area farms reported..		26,400	1,280	84.5	
Young alfalfa.....	1,150	Under water right applications..		26,040	1,262	81.3	
Irrigated without crop..	40	Under rental contracts.....		360	18	1.2	
Building sites and miscellaneous.....	280	Total cropped area farms reported..		25,845	1,280	82.7	
Less duplicated areas.....	1,660						
Total irrigated acreage	26,400						

PROPOSED NEW UNITS.

During the year investigations have been conducted in connection with proposed additional units of the Yakima project, as follows:

Kittitas unit, lying in Kittitas County and in the vicinity of Ellensburg, comprising 70,000 acres. Some office work was done in the revision of estimates on this unit, but no field work was undertaken.

Moxee unit, comprising about 40,000 acres, all in Yakima County and lying above present canals in the Wenas, East Selah, and Moxee Valleys. On this unit all section lines were run and topography taken over the entire area. Section plats have been completed with a 5-foot contour interval and 400 feet = 1 inch scale. Final location of about 15 miles of the main canal had been made at the close of the year.

Reza unit, consisting of about 60,000 acres in Yakima and Benton Counties and lying principally above the Sunnyside Canal. Topography has been taken over about 70 per cent of the area, but no location lines made in the field.

Kennewick unit covers about 35,000 acres in Benton County south of the Yakima River and Oregon-Washington Railroad & Navigation Co. in the vicinity of Kennewick and Kiona. Topography has been taken over about 50 per cent of the area. The plans for this unit

contemplate picking up return flow at the Prosser Dam, diverting through a power canal on the left bank of the Yakima River for a distance of about 10½ miles, where a part of the water is dropped back to the river, and generating power for pumping the balance across the river to a higher elevation, where it is carried by canal to the lands in the vicinity of Kiona and Kennewick.

BOARD MEETINGS.

Date.	Subject.	Personnel.
Jan. 8, 1919.....	Additional units to Yakima project.	D. C. Henny, R. F. Walter, R. K. Tiffany, C. E. Crowmover.
Mar. 5, 1919.....	.....do.....	D. C. Henny, R. F. Walter, James Munn, R. K. Tiffany, C. E. Crowmover.

PUBLIC NOTICE AND ORDERS.

SUNNYSIDE UNIT.

PUBLIC NOTICE, MARCH 11, 1919.

1. In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charges for the irrigation season of 1919 and thereafter until further notice against all lands of the Sunnyside unit, Yakima project, Washington, under public notice, shall be as herein-after stated.

2. **Classification of lands.**—For the purpose of equitably determining the operation and maintenance charges, the lands of the Sunnyside unit have been divided by the Sunnyside Valley irrigation district into three classes, according to water requirements, viz, A, B, and C, and a map showing such classification is on file in the office of the project manager, and in the office of the irrigation district.

3. **Operation and maintenance charges.**—Each acre of irrigable land, whether water is used thereon or not, shall be charged with a minimum operation and maintenance charge of \$2, which will permit delivery of not more than the following amounts per irrigable acre: To lands of class A, 2 acre-feet; to lands of class B, 2½ acre-feet; to lands of class C, 3 acre-feet. For additional water above the foregoing amounts, the rate shall be 50 cents per acre-foot: *Provided*, That for newly reclaimed lands no charge will be made for water actually needed in excess of the amount covered by a charge of \$2 per irrigable acre at the said rates.

4. **Time of payment.**—All operation and maintenance charges are due and payable annually on March 1 following the irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15 in any year, or where water-right application is made after August 1 in any year for land in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

TIETON UNIT.

PUBLIC NOTICE, NOVEMBER 15, 1918.

1. **Limitation of irrigable area.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), and also in accordance with the contract between the Tieton Water Users' Association and the United States, dated July 16, 1918, and the contract between the United States and the Yakima-Tieton irrigation district, dated July 18, 1918, public notice is hereby given that the area of the Tieton unit, Yakima project, Washington, is limited to 32,000 acres of irrigable land, designated on approved farm unit plats of the following described townships, as now in effect, to wit: Tps. 12, 13, 14, and 15 N. R. 16 E., Willamette meridian; Tps. 12, 13, and 14 N., R. 17 E., Willamette meridian; Tps. 12, 13, and 14 N., R. 17 E., Willamette meridian. All lands not now shown on said farm unit plats are excluded from the Tieton unit. Copies of said plats are on file in the office of the project manager, United States Reclamation Service, and in the local land office, both at Yakima, Wash.

2. **Water charges.**—The water charges for said 32,000 acres of land shall be subject not only to public notices heretofore and hereafter issued pursuant to the reclamation law, but shall include also the supplemental construction charges, authorized by the irrigation district election of July 6, 1918, and payable by the district lands, pursuant to said contract with the Yakima-Tieton irrigation district: *Provided*, That in computing construction charges on any tract, and determining the 5 per cent increase of charges required by section 9 of said reclamation extension act there shall be eliminated any period during which water-right applications were not receivable by the United States for such tract.

E. C. BRADLEY,
Assistant to the Secretary of the Interior.

PUBLIC NOTICE, MARCH 11, 1919.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charges for the irrigation season of 1919 and thereafter until further notice against all lands of the Tieton unit, Yakima project, Washington, under public notice, will be as follows: For all water delivered between June 1 and August 31, inclusive, a charge of \$1 per acre-foot will be made; and for all water delivered at other times during the irrigation season a charge of 60 cents per acre-foot will be made: *Provided*, That a minimum charge of \$1.25 per irrigable acre will be made whether water is used or not, which minimum amount when paid will be credited upon the account for water delivered at the above acre-foot rates. All operation and maintenance charges are due and payable annually on March 1 following the irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15 in any year, or where water-right application is made after August 1 in any year for land

in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Yakima project, June 30, 1919.

Cash		\$5,978.95
Inventory of materials and supplies on hand		343,489.28
Accounts receivable:		
Construction contract, water-right charges unaccrued		5,154,286.84
Uncollected accounts		89,900.14
Construction work contracted		5,948.19
Gross construction cost		
Less construction revenue earnings	\$209,567.62	\$10,633,016.23
Less cost adjustments	8,223.44	
		217,801.06
Net construction cost		10,415,215.17
Gross operation and maintenance cost	1,368,086.30	
Less operation and maintenance revenue earnings	65,902.16	
		1,302,184.14
Accounts payable		114,555.41
Contingent obligations		11,856.50
Collections and contracts of specific amounts for repayments to reclamation fund		8,288,567.14
Capital investment:		
Disbursement, transfer, and joint construction vouchers received	\$12,943,553.93	
Collection, transfer, refund, and joint construction vouchers issued	4,041,440.27	
Net investment		8,902,113.66

Feature costs of Yakima storage unit to June 30, 1919.

Principal feature.	Fiscal year 1919.	To June 30, 1919.
Examination and surveys: General storage—		
Reservoir reconnaissance		\$2,927.92
Hydrographic surveys		5,460.48
Hydrographic investigations		29,303.43
High-line investigations		2,700.12
American River investigations		1,998.38
Total examinations and surveys		42,390.33
Storage works:		
Tieton Dam—		
Preliminary and general work		19,923.46
Dam	\$3,133.12	65,751.35
Tunnel	12,100.79	231,082.76
Clearing reservoir	18,887.42	108,136.37
	34,121.33	424,893.94
Kachess Dam—		
Preliminary and general work		13,772.37
Dam	18.90	416,553.45
Spillway		36,656.58
Clearing reservoir		187,200.48
	18.90	653,182.88
Keechelus Dam—		
Preliminary and general work		21,477.58
Dam	1,831.93	1,309,564.45
Spillway	3,121.74	129,756.79
Tunnel		115,865.15
Clearing reservoir	52,061.00	286,943.54
	57,004.67	1,863,607.51
Clealum Dam—		
Preliminary and general work		33,832.24
Dam		116,852.59
Clearing reservoir	366.95	10,569.01
	366.95	161,253.84

Feature costs of Yakima storage unit to June 30, 1919—Continued.

Principal feature.	Fiscal year 1919.	To June 30, 1919.
Storage works—Continued.		
Clear Creek Dam (third development)—		
Dam.....	\$28,519.94	\$50,916.75
Spillway.....	3,272.81	5,037.58
	31,792.75	55,954.33
Total storage works.....	123,304.60	3,158,892.50
Permanent improvements to lands:		
Tieton Dam—		
Roads.....	21,239.48	148,334.92
Bridges.....	142.72	14,987.82
	21,196.76	163,322.74
Kachess Dam—		
Buildings.....		2,623.56
Roads.....		4,466.78
		7,090.34
Keechelus Dam—		
Buildings.....		2,768.04
Roads.....		15,891.90
Bridges.....		3,714.60
		22,374.54
Clealum Dam—Buildings.....		500.17
Total permanent improvements.....	21,196.76	193,287.79
Telephone system:		
Tieton Dam.....		1,125.72
Kachess Dam.....		971.56
Keechelus Dam.....	9.00	3,255.61
Clealum Dam.....		142.62
Total telephone system.....	9.00	5,495.51
Total cost of construction features.....	144,510.36	3,400,066.13
Plant accounts.....		259,050.39
Unadjusted clearing accounts.....		118,395.69
Undistributed storage, operation and maintenance.....		5,592.38
Gross construction cost.....	144,510.36	3,783,104.59
<i>Less revenues earned during construction period.</i>		
Rental of buildings.....	1,231.13	30,297.40
Rental of grazing and farm lands.....	305.00	556.00
Rental of camp sites.....	532.00	532.00
Net power earnings (prior to public notice).....		1,766.13
Rentals of irrigation water.....	17,487.50	21,792.50
Rentals of telephones and tolls.....	22.80	49.40
Contractors' freight refunds.....	157.75	157.75
Other revenues unclassified.....	25,518.03	126,260.58
Profit on hospital operation.....	958.05	1,316.52
Other profits on operations unclassified.....	1,319.94	1,742.35
Total revenues.....	47,532.20	184,470.63
Net construction cost, June 30, 1919.....	96,978.16	3,598,633.96

¹ Credit due to transfer of cost minor wood structures to road account.

Statement of costs by calendar years, Yakima storage unit.

	Construc- tion.	Operation and main- tenance.	Total cost.
Year ending Dec. 31—			
1910.....	\$686,578.84		\$686,578.84
1911.....	300,056.75		300,056.75
1912.....	¹ 282,541.90		¹ 282,541.90
1913.....	428,742.35		428,742.35
1914.....	439,333.12	\$517.15	439,850.27
1915.....	479,918.70	5,891.02	485,809.72
1916.....	559,439.14	3,997.36	563,436.50
1917.....	412,639.78	9,760.43	422,400.21
1918.....	358,851.49	9,599.64	368,451.13
1918.....	² 2,952.14		² 2,952.14
Jan. 1 to June 30, 1919.....			
Subtotal.....	3,400,066.13	29,765.60	3,429,831.73
Plant accounts.....	259,050.39		259,050.39
Unadjusted clearing accounts.....	118,395.69		118,395.69
Undistributed operation and maintenance.....	5,592.38		5,592.38
Total.....	3,783,104.59	29,765.60	3,812,870.19

¹ Credit due to transfer of cost Bumping Lake Reservoir to the Yakima-Tieton unit; amount, \$506,267.94.² Credit due to adjustment inventories.*Statement of costs by fiscal years, Yakima storage unit.*

	Construc- tion.	Operation and main- tenance.	Total cost.
Year ending June 30—			
1910.....	\$443,807.26		\$443,807.26
1911.....	337,361.17		337,361.17
1912.....	¹ 214,039.11		¹ 214,039.11
1913.....	284,545.65		284,545.65
1914.....	446,695.02		446,695.02
1915.....	500,188.76	\$517.15	500,705.91
1916.....	374,175.46	5,891.02	380,066.48
1917.....	542,432.48	3,997.36	546,429.84
1918.....	540,389.08	9,760.43	550,149.51
1919.....	144,510.36	9,599.64	154,110.00
Subtotal.....	3,400,066.13	29,765.60	3,429,831.73
Plant accounts.....	259,050.39		259,050.39
Unadjusted clearing.....	118,395.69		118,395.69
Undistributed storage, operation and maintenance.....	5,592.38		5,592.38
Total.....	3,783,104.59	29,765.60	3,812,870.19

¹ Credit due to transfer of Bumping Lake construction cost to Yakima-Tieton unit; amount, \$506,267.94.*Estimated cost of contemplated work, Yakima storage unit, during fiscal year 1920.*

Principal features.	Estimated cost.
Storage system: Clearing and logging at Keechelus Reservoir, and camp maintenance, Tieton Dam.....	\$10,000
Operation and maintenance under public notice.....	14,000
Reimbursable accounts.....	1,200
Total.....	25,200

Operating cost and revenues, Yakima storage unit, to Dec. 31, 1918.

Item.	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works.....	\$6,475.46	\$3,124.18	\$9,599.64	\$14,541.85	\$15,223.75	\$29,765.60
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			10,260.20			31,881.57
Total.....			10,260.20			31,881.57
Difference (excess).....			660.56			2,115.97

Feature cost of Yakima—Sunnyside unit.

Principal features.	Costs.	
	Fiscal year 1919.	Total to June 30, 1919.
Examinations and surveys ¹	\$13,638.71	\$47,060.23
Pumping for irrigation:		
Snipes Mountain irrigation district.....	7,340.56	62,025.23
Outlook irrigation district.....	4,118.77	101,757.60
Grandview irrigation district.....	8,334.94	108,438.70
Prosser irrigation district.....	55,306.45	130,038.91
	75,100.72	402,260.44
Canal system: Main canal.....		1,681,694.68
Lateral system:		
General gravity system.....		727,141.82
Sunnyside irrigation district.....		108,705.02
Snipes Mountain irrigation district.....		35,499.64
Outlook irrigation district.....		108,084.95
Grandview irrigation district.....	590.35	83,019.04
Prosser irrigation district.....	14,104.36	39,880.68
Supplemental construction.....		2,606.40
	14,694.71	1,104,887.55
Drainage system: Investigation.....		11,418.80
Farm units.....		22,462.15
Permanent improvements, buildings and grounds.....		36,128.55
Telephone system.....		22,412.57
Operation and maintenance charges transferred and compounded with construction.....	599.88	18,720.24
Total cost of construction features.....	76,726.60	3,347,045.21
Plant accounts.....		8,554.66
Gross construction cost.....	76,726.60	3,355,599.87
Less revenues earned during construction period:		
Rental of buildings.....		3,924.09
Contractors' freight refunds.....	6.46	11,029.82
Profit on hospital operations.....	246.25	1,224.52
Total revenues.....	252.71	16,178.43
Net construction cost, June 30, 1919.....	76,473.89	3,339,421.44

¹ Accounts for Kennewick district and Yakima high-line, amounting to \$13,955.80, June 30, 1918, transferred from Yakima-Sunnyside unit to Yakima high-line unit.

Statement of costs by calendar years of Yakima-Sunnyside unit.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending Dec. 31—			
1907.....	\$550,161.00	\$45,438.41	\$595,599.41
1908.....	244,100.06	47,592.06	291,692.11
1909.....	174,339.32	51,946.01	226,285.33
1910.....	642,867.08	82,223.95	725,091.03
1911.....	604,636.56	83,252.51	687,889.07
1912.....	153,779.92	86,480.45	240,260.37
1913.....	14,806.80	83,958.92	98,765.72
1914.....	87,471.24	78,709.20	166,180.44
1915.....	398,278.84	66,864.65	465,143.49
1916.....	135,880.15	72,011.11	207,891.26
1917.....	156,093.91	97,008.50	253,102.41
1918 ¹	141,063.25	127,041.32	268,094.57
To June 30, 1919.....	43,577.09	72,330.35	115,907.44
Subtotal.....	3,347,045.21	994,857.44	4,341,902.65
Plant accounts.....	8,554.66		8,554.66
Total.....	3,355,599.87	994,857.44	4,350,457.31

¹ Cost of Yakima high-line and Kennewick extension, amounting to \$20,017.94, transferred from Yakima-Sunnyside unit to Yakima high-line unit accounts Sept. 30, 1918.

Statement of costs by fiscal years, Yakima-Sunnyside unit.

	Construction.	Operation and maintenance under public notice.	Total cost.
Year ending June 30—			
1907.....	\$284,355.48	\$30,971.13	\$315,326.61
1908.....	237,337.31	49,221.16	286,558.47
1909.....	289,040.64	49,453.67	338,494.31
1910.....	550,533.44	64,811.50	615,344.94
1911.....	597,597.57	86,437.82	684,035.39
1912.....	385,810.24	95,541.15	481,351.39
1913.....	38,163.16	66,256.68	104,419.84
1914.....	13,720.41	89,111.28	102,831.69
1915.....	367,830.51	66,036.05	433,866.56
1916.....	159,987.90	68,353.60	228,341.50
1917.....	217,140.29	83,980.23	301,120.52
1918.....	128,811.66	107,070.47	235,882.13
1919 ¹	76,726.60	137,612.70	214,339.30
Subtotal.....	3,347,045.21	994,857.44	4,341,902.65
Plant accounts on June 30, 1919.....	8,554.66		8,554.66
Total.....	3,355,599.87	994,857.44	4,350,457.31

¹ Cost of Yakima high-line and Kennewick extension, amounting to \$20,017.94, transferred from Yakima-Sunnyside unit to Yakima high-line unit accounts Sept. 30, 1918.

Estimated cost of contemplated work, Yakima-Sunnyside unit, during fiscal year 1920.

Principal features.	Estimated cost.
Lateral system: Concrete lining, Prosser irrigation district.....	\$9,000
Operation and maintenance under public notice.....	114,000
Reimbursable accounts.....	1,200
Total.....	124,000

Operating costs and revenues, Yakima-Sunnyside unit, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works (proportion of cost)	\$6,425.85	\$4,234.81	\$10,660.66	\$10,326.91	\$4,810.04	\$15,136.95
Canal system:						
Diversion dam and head-works	625.77	416.27	1,042.04	3,250.55	3,990.53	7,241.08
Main and branch canals	12,320.83	58,130.67	70,451.50	158,133.66	370,425.41	528,558.97
Total canal system	12,946.60	58,546.94	71,493.54	161,384.11	374,415.94	535,800.05
Lateral system: Laterals and wasteways	13,745.58	32,960.77	46,706.35	130,518.33	259,835.70	390,354.03
Gross cost	33,118.03	95,742.52	128,860.55	302,229.35	639,061.68	941,291.03
Less operation and maintenance charges transferred to and compounded with construction charges			1,819.23			18,763.94
Net cost			127,041.32			922,527.09
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants			107,295.16			801,935.84
Operation and maintenance charges paid in advance by water-right applicants			1 266.55			381.49
Operation and maintenance charges paid and forfeited by water-right applicants			38.00			88.92
Penalties on operation and maintenance charges accrued on contracts with water-right applicants			2,185.44			10,662.56
Rental of land and buildings during operating period			2,166.33			6,064.57
Rentals of irrigation water			4,499.02			44,879.21
Rental of telephone and tolls during operating period						13.15
Other revenues unclassified, earned during operating period			29.50			1,250.57
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants			1 396.02			1 2,720.30
Total			115,540.88			862,556.01
Difference (deficit)			11,500.44			59,971.08

¹ Includes accruals for public notice lands, year 1918, \$57,983.66, taken into account January, 1919.

Feature costs of Yakima-Tieton unit.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and survey.....		\$69,694.56
Storage works:		
Bumping Lake Dam.....		550,837.42
Clear Creek Dam.....		84,542.78
		635,380.20
Canal system:		
Headworks.....		14,937.15
Tunnels.....		397,100.73
Main canal.....	\$71,999.46	759,396.05
Wasteways.....		57,181.22
Culverts and drains.....		22,453.97
Supplemental construction.....	90,173.73	90,173.73
	162,173.19	1,341,242.85
Lateral system:		
Headworks and diversion dams.....		26,958.20
Laterals and sublaterals.....		855,886.93
Flumes.....		108,390.45
Bridges.....		5,562.36
Drops, chutes, checks, and turnouts.....		77,442.46
Siphons.....		14,175.95
Wasteways.....		11,067.21
Culverts and drains.....		54,226.07
		1,153,709.63
Permanent improvements and lands:		
Buildings and grounds.....		41,943.95
Roads.....		59,573.55
Real estate.....		2,768.60
		104,286.10
Telephone system.....		25,148.78
Operation and maintenance during construction (water-rental basis).....		10,208.54
Operation and maintenance transferred to and compounded with construction.....	2,701.65	40,613.74
Gross construction cost, June 30, 1919.....	164,874.84	3,380,284.40
Less revenues earned during construction period:		
Rentals of buildings.....		4,827.35
Rentals of irrigating water.....		3,526.50
Contractors' freight refunds.....		5,092.12
Other revenues, unclassified.....		1,522.11
Hospital operations, profit.....	280.80	2,947.09
	280.80	17,915.17
Net construction cost, June 30, 1919.....	164,594.04	3,362,369.23

Statement of costs by calendar years, Yakima-Tieton unit, Washington.

	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
Year ending Dec. 31—					
1907.....	\$174,725.75				\$174,725.75
1908.....	478,025.00				478,025.00
1909.....	631,275.00				631,275.00
1910.....	587,278.00	\$10,208.54		\$10,208.54	597,486.54
1911.....	928,785.63		\$22,003.53	22,003.53	950,789.16
1912.....	220,690.90		39,355.11	39,355.11	260,046.01
1913.....	22,395.00		43,857.57	43,857.57	66,252.57
1914.....	77,103.34		41,174.81	41,174.81	118,278.15
1915.....	38,776.09		7,159.66	7,159.66	45,935.75
1916.....	25,005.94		36,335.43	36,335.43	61,341.37
1917.....	20,592.52		41,652.66	41,652.66	62,245.18
1918.....	72,967.27		69,154.13	69,154.13	142,121.40
Jan. 1 to June 30, 1919.....	92,456.42		35,839.97	35,839.97	128,296.39
Subtotal.....	3,370,075.86	10,208.54	336,532.87	346,741.41	3,716,817.27
Plant accounts.....			6,930.39	6,930.39	6,930.39
Total.....	3,370,075.86	10,208.54	343,463.26	353,671.80	3,723,747.66

Statement of cost by fiscal years, Yakima-Tieton unit, Washington.

	Construction.	Operation and maintenance.			Total cost.
		During construction.	Under public notice.	Total.	
Year ending June 30—					
1907.....	\$177,018.59				\$177,018.59
1908.....	478,256.92				478,256.92
1909.....	631,056.66				631,056.66
1910.....	584,647.91	\$10,208.54		\$10,208.54	594,856.45
1911.....	906,776.57		\$16,093.92	16,093.92	922,870.49
1912.....	218,372.47		26,447.16	26,447.16	244,819.63
1913.....	22,032.06		41,215.75	41,215.75	63,247.81
1914.....	36,817.09		40,966.73	40,966.73	77,783.82
1915.....	88,959.11		19,643.62	19,643.62	108,602.73
1916.....	15,485.55		28,183.90	28,183.90	43,669.45
1917.....	30,642.59		38,284.56	38,284.56	68,927.15
1918.....	15,135.50		56,250.51	56,250.51	71,386.01
1919.....	164,874.84		69,446.72	69,446.72	234,321.56
Subtotal.....	3,370,075.86	10,208.54	336,532.87	346,741.41	3,716,817.27
Plant accounts.....			6,930.39	6,930.39	6,930.39
Total.....	3,370,075.86	10,208.54	343,463.26	353,671.80	3,723,747.66

Estimated cost of contemplated work, Yakima-Tieton unit, during fiscal year 1920.

Principal features.	Estimated cost.
Canal system: Main canal.....	\$4,500
Operation and maintenance under public notice.....	76,000
Reimbursable accounts.....	1,200
Total.....	81,700

Operating cost and revenues, Yakima-Tieton unit, to Dec. 31, 1918.

	Calendar year 1918.			To Dec. 31, 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COST.						
Storage works: Proportion of operation and maintenance cost.	\$3,322.93	\$2,665.46	\$6,518.39	\$11,569.80	\$4,506.13	\$16,075.93
Canal system: Main canal.....	1,983.36	2,120.70	4,104.06	17,859.89	23,947.17	41,807.06
Lateral system:						
Main laterals.....	4,712.78	26,665.56	31,408.34	76,150.45	137,299.15	213,479.60
Sublaterals.....	4,368.94	17,189.53	21,558.47	5,131.99	40,823.96	45,955.95
Total lateral system.....	9,081.72	43,885.09	52,966.81	81,312.44	178,123.11	259,435.55
Undistributed expenses:						
Buildings.....		1,319.70	1,319.70		13,216.61	13,216.61
Highways.....					3,599.67	3,599.67
Real estate.....		4,500.17	4,500.17		4,500.17	4,500.17
Feature subtotal.....		5,819.87			21,296.45	
	14,888.01	54,521.12	69,409.13	110,742.13	227,862.86	338,604.99
Less unpaid operation and maintenance charges added to construction cost.....			255.00			37,912.09
Subtotal.....			69,154.13			300,692.90
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants.....			53,737.77			310,271.11
Operation and maintenance charges paid in advance by water-right applicants.....						72.11
Operation and maintenance charges paid and forfeited by water-right applicants.....			10.50			22.50
Penalties on operation and maintenance charges accrued on contracts with water-right applicants.....			1,828.20			2,800.06
Rental of land and buildings during operating period.....			1,477.67			7,620.59
Rentals of irrigation water.....			643.50			2,067.50
Other revenues unclassified, earned during operating period.....						13.46
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants.....			1,543.28			13,815.49
Total.....			50,154.36			319,051.84
Difference:						
Excess.....						13,358.94
Deficit.....			12,999.77			

¹ Deduct.

Feature costs of Yakima High-line unit to June 30, 1919.

Principal feature.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$103,899.49	\$103,899.49
Balance in plant accounts.....		8,690.69
Unadjusted clearing accounts.....		1,437.19
Gross construction cost.....	103,899.49	114,027.37
Loss on hospital operations:		
Yakima high-line unit.....	722.57	722.57
Yakima office.....	40.60	40.60
Total.....	763.17	763.17
Net construction cost.....	104,662.66	114,790.54

Statement of costs by calendar years, Yakima High-line unit.

	Construction.	Total cost.
Year ending Dec. 31, 1918.....	\$45,901.82	\$45,901.82
To June 30, 1919.....	57,997.67	57,997.67
Subtotal.....	103,899.49	103,899.49
Plant accounts.....	8,690.69	8,690.69
Unadjusted clearing accounts.....	1,437.19	1,437.19
Total.....	114,027.37	114,027.37

Statement of costs by fiscal years, Yakima High-line unit.

	Construction.	Total.
Year ending June 30, 1919.....	\$103,899.49	\$103,899.49
Plant accounts.....	8,690.69	8,690.69
Unadjusted clearing accounts.....	1,437.19	1,437.19
Total.....	114,027.37	114,027.37

Estimated cost of contemplated work, Yakima High-line unit, during fiscal year 1920.

Principal features.	Estimated cost.
Examination and surveys.....	\$23,000
Reimbursable accounts.....	900
Total.....	23,900

WYOMING, SHOSHONE PROJECT.

A. H. AYERS, project manager, Powell, Wyo.

LOCATION.

Counties: Park and Big Horn.

Townships: 52 to 58 N., Rs. 96 to 104 W., sixth principal meridian.

Railroad: Chicago, Burlington & Quincy.

Railroad stations and estimated population June 30, 1919: Cody, 1,200; Corbett¹; Deaver, 200; Ralston²; Powell, 1,000; Garland, 75; Mantua¹; and Frannie, 75;

WATER SUPPLY.

Source of water supply: Shoshone River.

Area of drainage basin: 1,380 square miles.

Annual run-off in acre-feet: Shoshone River near Cody (1,380 square miles), 1903-1918, maximum 1,465,500, minimum 846,372, mean 1,143,960.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to deliver water season 1919: 56,119 acres.

Works nearly completed for seventh unit, but not open to entry: 11,000 acres.

Area under water-right applications, season of 1919: 51,348 acres.

Area under rental contract season 1919: 496.5 acres.

Length of irrigating season: April 10 to November 1.

Average elevation of irrigable area: 4,500 feet above sea level.

Rainfall on irrigable area: 1907-1918, average 6.15 inches; 1918, 6.96 inches.

Range of temperature on irrigable area: -36° F. to 104° F.

Character of soil of irrigable area: Light sandy to heavy clay.

Principal products: Alfalfa, grain, sugar beets, potatoes, vegetables, cattle, hogs, and dairy products.

Principal markets: Omaha, Nebr.; Kansas City, Mo.; Chicago, Ill.; Denver, Colo.; Billings, Mont.; and local.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders relating thereto: July 17, 1918, and March 11, 1919.

Location of lands opened: Tps. 54 to 56 N., Rs. 96 to 100 W., sixth principal meridian.

Present status of irrigable lands opened: 50,194 acres of public and 1,154 acres of private land under water-right application, 2,090 acres of unentered public land and 2,681 acres of private and State land open to entry for which water is available, but for which no water-right application has been made.

Limit of area of farm units: Public, 80 acres; private, 160.

Duty of water: 2.2 acre-feet per acre per annum at the farm.

Building charge per acre of irrigable land: \$69.50 on first unit; \$70.50 on second unit; \$71.50 on third, fourth, and fifth units, \$66 for sixth unit.

The annual operation and maintenance charge for 1919 is a minimum charge of \$1.10 per irrigable acre whether water is used thereon or not, under which charge water users will be entitled to receive 1½ acre-feet of water per acre; plus charges for additional water that will be furnished up to a limit of 1 additional acre-foot per irrigable acre at the rate of 25 cents per acre-foot, and all further supply at 50 cents per acre-foot.

CHRONOLOGICAL SUMMARY.

Reconnaissance made and preliminary surveys begun in 1903.

Construction recommended by board of engineers, February 1, 1904.

Construction authorized by Secretary, February 10, 1904.

Corbett diversion dam completed June, 1907.

Corbett tunnel completed November, 1907.

First irrigation by Reclamation Service, season of 1908.

Shoshone Dam completed January, 1910.

Project 65 per cent completed June 30, 1919.

¹ Railroad sidings only.

² Population less than 25.

IRRIGATION PLAN.

The irrigation plan of the Shoshone project provides for the storage of flood waters of Shoshone River in a reservoir controlled by Shoshone Dam, about 8 miles above Cody, Wyo.; the diversion of water from Shoshone River by a dam at Corbett, about 16 miles below the reservoir, and through the Corbett Tunnel into a canal system supplying water to lands on the north side of the river in the vicinity of Ralston, Powell, Garland, Mantua, Frannie, and Deaver; the diversion into the Willwood Canal for the irrigation of lands on the south side of the Shoshone River; and the diversion into the north side high line from the Shoshone Dam for the irrigation of lands lying on the north side of the Shoshone River above the Garland Canal system, and extending from the lower end of the Shoshone Canyon near Cody to the divide between the Shoshone River and Clarks Fork drainage.

The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The Shoshone Dam, Corbett Dam, Corbett Tunnel, Garland Canal, about 34 miles of Frannie Canal, the lateral and distributary system for approximately 61,000 acres in the vicinity of Ralston, Powell, Garland, Mantua, Deaver, and Frannie, have been completed, and the system partially completed for about 10,000 acres in the Frannie division which has not yet been opened to entry.

Future operations will include completion of the remainder of the second and the construction of the third unit, Frannie division. The shortage of funds has interfered with progress on this work, but with an addition to the allotment for the project of \$100,000, the construction of the Frannie division will be resumed, thereby furnishing employment to dry-land farmers who have experienced crop failure and also give employment to discharged soldiers and sailors. The construction of the Willwood and Hart Mountain divisions will not be begun until further funds are available.

SUMMARY OF GENERAL DATA FOR SHOSHONE PROJECT TO END OF FISCAL YEAR 1919.

Areas:		
Irrigable acreage when project is complete.....		136, 618
Public land entered to end of fiscal year.....	50, 194	
Public land open to entry at end of fiscal year.....	2, 090	
Public land withdrawn at end of fiscal year ¹	71, 600	
State land, unsold, June 20, 1919.....	5, 779	
Railroad land.....	700	
Private land.....	6, 255	
Estimated acreage service can supply, season of 1919.....		56, 119
Estimated acreage service can supply July 1, 1920.....		66, 500
Acreage actually irrigated, season of 1918.....		38, 282
Acreage cropped under irrigation, season 1918.....		37, 689
Crops:		
Value of irrigated crops, season of 1918.....	\$1, 486, 382	
Value of irrigated crops, per acre cropped.....	\$39. 44	
Finances:		
Net construction cost to June 30, 1919.....	\$6, 020, 686. 21	
Per cent completed at end of fiscal year.....	65	
Appropriated for fiscal year 1920.....	\$343, 000	
Estimated per cent completed by June 30, 1920.....	67	
Proposed appropriation for fiscal year 1921.....	459, 000	
Estimated per cent complete by June 30, 1921.....	70	
Announced construction charges per acre.....	{ \$66, \$69.50 \$70.50, \$71.50	
Appropriation fiscal year 1919:		
Reclamation fund.....	\$400, 000. 00	
Special appropriation.....	322, 164. 67	
Balance 1918 appropriation.....	92, 963. 18	
Increased compensation.....	12, 955. 98	
Increase miscellaneous collections.....	55, 219. 74	
		883, 303. 57

¹ The Oregon Basin, for which land has been withdrawn but construction of which has not yet been approved, is not included in the above tabulation. Quantities are: Irrigable acreage, 90,000; public lands, 86,600; state lands, 2,400; private lands, 1,000.

Expenditures chargeable to 1919 appropriation:

Disbursements.....	\$537, 923. 75
Transfers.....	25, 096. 33
Current liabilities.....	25, 148. 92
Contingent liabilities.....	1, 553. 83
	<hr/>
	\$589, 722. 83

Unencumbered balance on July 1, 1919.....	<hr/>	\$293, 580. 74
---	-------	----------------

Repayments:

Value of construction water right contracts.....	3, 535, 490. 46
Construction charges—	
Accrued to June 30, 1919.....	410, 015. 63
Collected to June 30, 1919.....	404, 308. 91

Uncollected on June 30, 1919.....	<hr/>	5, 706. 72
-----------------------------------	-------	------------

Operation and maintenance charges (public notice)—

Accrued to June 30, 1919.....	243, 934. 01
Collected to June 30, 1919.....	227, 724. 34

Uncollected to June 30, 1919.....	<hr/>	16, 209. 67
-----------------------------------	-------	-------------

Water-rental charges—

Accrued to June 30, 1919.....	5, 875. 63
Collected to June 30, 1919.....	5, 607. 74

Uncollected to June 30, 1919.....	<hr/>	267. 89
-----------------------------------	-------	---------

Drainage:

Estimated acreage damaged by seepage on June 30, 1919.....	1, 450
--	--------

Miles of drains built to end of fiscal year—

Open.....	18
Closed.....	82

100

Estimated acreage protected by drains built to end of fiscal year..	24, 000
---	---------

Estimated acreage to be protected by authorized system.....	37, 000
---	---------

Cost of drainage works to end of fiscal year.....	\$674, 707. 13
---	----------------

CONSTRUCTION DURING FISCAL YEAR.

Frannie division.—Work was completed on contract No. 737, Hoyt Hayden, Great Falls, Mont., for the construction of the main canal through the second unit. Claims for extra compensation because of diversion of the contractors' forces to Government forces' farming operations during 1917 were amicably settled. Work was continued intermittently on the second unit lateral system contracts, No. 764, David Lewis, Cowley, Wyo.; No. 755, N. O. Mortensen, Cowley, Wyo.; and No. 754, Tebbs and Taggart, completion varying from 85 to 95 per cent. Slow progress on these contracts is primarily due to the contractors' difficulty in securing competent help. Settlement was effected with Peter Shirts, Garland, Wyo., on his contract No. 736, suspended September 15, 1917, without recourse to litigation.

In addition to the above contract work a few informal contracts were entered into for miscellaneous excavation and back-fill work, notably one with G. B. Wilson, of Cowley, Wyo., for the construction of Deaver Canal extensions to cover about 600 acres of State school land embraced in the first unit.

Work by Government forces, plans for which include principally completion of structures on the second unit, 60 per cent completed

June 30, 1918, was greatly hindered during the fall of 1918 by an acute labor shortage and was not resumed in the spring because of the lack of funds; the work is 68 per cent completed. The other work by Government forces consists of structure construction on the extension of the first unit to private lands subscribed during the year. The area covered is 675 acres, and the work is 70 per cent completed. Sufficient works were constructed to permit delivery of water to all subscribed lands in time to make crops.

114-F concrete pressure pipe and Deaver Reservoir.—This pressure pipe was tested out in July, 1918, disclosing a number of collar leaks which were immediately repaired. In October the pipe was again put in operation and successfully used to fill Deaver Reservoir. This reservoir of about 600 acre-feet capacity, although designed principally as a regulator for the lateral system under the pressure pipe also acts as storage reservoir for Deaver Camp and town-site water supplies; the connection is an 8-inch wood-stave pipe line 2.5 miles long, giving at the camp a 200-foot hydrostatic head. This water supply was of great benefit to the community during the winter, as there is no other adequate potable water supply on the division, and in previous years it has been necessary for the Government to ship in water by railroad from Warren, Mont., 14 miles distant. The pressure pipe was damaged by a heavy frost while in operation and some further repairs will be necessary before it can be used. Deaver Reservoir has proven satisfactory as regards seepage, the combined loss from seepage and evaporation being less than 0.5 foot per month.

Garland division.—H. S. Jolley, of Lovell, Wyo., completed his contract, No. 758, for earthwork 67F system. The structures were completed the previous year. The land under this system, about 1,100 acres in the vicinity of Garland, is now ready to be opened for entry.

A system for the recapture of waste water from Bitter Creek, known as Bitter Creek lateral No. 5, was built mostly by Government forces, although some earthwork was done under informal contract. This system cost \$8,000 and restores to the system a maximum of 35 second-feet with a steady flow of 20 second-feet since June 1, 1919. This line is a very material aid to the operation of Garland Canal.

Corbett Tunnel.—During the fiscal year tests were conducted on this tunnel to determine the value of the resurfacing of the invert done during the previous year. It is gratifying to note that the work was successful and has brought the capacity of the tunnel up to 1,000 second-feet as designed.

SEEPAGE AND DRAINAGE.

Drainage works on Shoshone project have been constructed entirely within the Garland division. Work during the fiscal year 1919 was carried on with three machines, the Austin trencher, P. & H. back filler, and Lidgerwood drag line. In the summer of 1918, a Bucyrus drag line was transferred from the Huntley project, but on account of the shortage of available funds this machine has not been put into operation, although it has been thoroughly over-

hauled and is now in readiness for work when funds become available. During the year 4.29 miles of open drain and 6.74 miles of closed drain were constructed, making a total since drainage construction was begun in 1911 of 82.36 miles of closed and 18.03 miles of open drain. The principal work accomplished during the fiscal year was the deepening of the channel of Bitter Creek, which is the main natural drainage outlet for the entire Garland division. The area protected by constructed drains is about 24,000 acres. Conditions in the northern part of the Garland division are rapidly becoming worse and data are being collected to determine the ground water level and the type of drains to be constructed in that portion of the division. Seepage is also beginning to develop on the Frannie division and similar studies are planned.

BOARD MEETINGS.

Date.	Topic.	Personnel.
Sept. 6, 1918.....	Oregon Basin investigations.....	A. J. Wiley, Chas. P. Williams, Geo. O. Sanford.
May 16, 1919.....	Drainage program for 1919.....	J. L. Burkholder, A. H. Ayers, J. R. Iakisch.

OPERATION AND MAINTENANCE.

The canal system on the Garland division was operated as in previous years, water being delivered upon request of the farmers until the maximum capacity of the canals had been reached. When additional requests were received it was necessary either to wait until someone had finished irrigating or else pro rate the water to all of the farmers under the ditch. Under this method the service was satisfactory, except in a very few cases.

On the first unit of the Frannie division the system was first operated in the season of 1918 and considerable difficulty was experienced from erosion and breaks in the banks of the main canal. Deliveries to lands under lateral D-56 for that season were somewhat delayed on account of the suspension of contract No. 736 with Peter Shirts and the difficulty in securing labor for organizing crews to complete this work with Government forces. The work was not completed so that deliveries of water could be made to some of the lands opened under public notice dated August 29, 1917, until the early part of June, 1918.

Complaints from most of the farmers whose lands were affected were received and a reduction in the operation and maintenance charge was approved by the assistant to the Secretary on February 24, 1919. Conditions on the Frannie division have been easier to control this season and deliveries have been continuous and satisfactory. Lateral extensions are in progress to provide deliveries to 675 acres of private and State school land in the first unit for nearly all of which water-right application has been made.

The operation and maintenance rates for the season of 1918 provided for an increased charge during the period of heavy demand for water June 16 to August 15 when the canals are taxed to the maximum carrying capacity. During the peak period the farmers' waste was

proportionately less than subsequently, but it is doubtful if this result was due to the rate increase, more probably being due to the farmers' realization of the necessity for economy during that time. Strong objection from the water users to the scheme resulted in its abandonment. Arrangements made in 1918 for recovering surface waste and applying it to beneficial use has been a success and the delivery of 25 second-feet a day into the main canal was begun in the month of May.

The Reclamation Service is delivering water on a rental basis to the State school lands which had previously been irrigated with waste and seepage water diverted from Bitter Creek. Whether or not payment will be made under the rental contracts entered into with owners of these State school lands will be determined when the decision of this matter, which is now in litigation, is reached.

Historical review, Shoshone project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which service is prepared to supply water.....	41,168	42,816	42,623	43,265	55,266	56,119
Acreage irrigated.....	22,226	25,753	29,977	32,984	38,282	137,688
Miles of canal operated.....	245	247	266	286	381	384
Water diverted (acre-feet).....	98,390	96,217	125,622	128,629	162,463	192,259
Water delivered to land (acre-feet).....	52,789	54,668	70,247	68,730	84,378	144,209
Per acre of land irrigated (acre-feet).....	2.38	2.12	2.34	2.10	2.29	1.17

¹ To June 30, 1919.

SETTLEMENT.

The condition of the banks, which is good evidence of the prosperity of the project, shows an increase in deposits of 26 per cent to a sum total of \$630,000. Water-right application was made in the spring of 1919 for about 675 acres of private lands which are included in the first unit of the Frannie division. Notwithstanding the fact that the units which remained open to entry on the Garland and Frannie divisions in the fiscal year 1919 were not particularly desirable, several of these units have been filed on and at present there remain only 12 units on the Frannie and 22 units on the Garland division open to entry.

The sale of town lots has been very active in Powell townsite. There remain unsold at the present time only about 40 lots. During the month of June 37 lots were sold, which is the highest number of lots sold in any one month during the year. Building operations in Powell have progressed rapidly and the cost of residences varies from \$3,500 to \$5,000 with one or two at \$7,500; \$100,000 is considered a conservative estimate for the total expenditure for building operations in Powell for the fiscal year 1919. Among notable improvements there contemplated is the construction this season of an \$80,000 high school.

The town of Deaver was incorporated in April, 1919. The town is placing a \$10,000 bond issue for the purpose of providing funds with which to construct the necessary extension of the Deaver water-supply system installed by the Reclamation Service to provide fire protection and universal opportunity for house connections. A con-

tract with the United States for the operation of the system is under consideration. The town of Deaver is making a steady and substantial growth and at present there are openings for many new commercial enterprises to supply the demands of the increasing population.

Settlement data, Shoshone project.

Item.	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	616	609	650	646	830	823
Population.....	1,400	1,500	1,800	2,000	3,000	1 3,200
Number of irrigated farms.....	424	460	577	620	770	789
Operated by owners or managers.....	359	363	458	465	610	616
Operated by tenants.....	65	97	119	155	160	173
Population.....	1,400	1,500	1,800	2,000	3,000	1 3,200
Number of towns.....	3	3	4	4	4	4
Population.....	525	515	650	700	1,000	1 1,300
Total population on farms and in towns...	1,925	2,015	2,450	2,700	4,000	1 4,500
Number of public schools.....	6	6	6	6	7	7
Number of churches.....	6	7	7	7	8	8
Number of banks.....	3	3	3	3	5	5
Total capital stock.....	\$60,000	\$60,000	\$60,000	\$60,000	\$75,000	\$110,000
Amount of deposits.....	\$158,665	\$177,228	\$252,746	\$361,000	\$497,775	\$629,556
Number of depositors.....	1,037	1,290	1,500	1,875	2,000	2,500
Number of relinquishments.....	14	13	22	13	15	31

¹ Estimated.

PRINCIPAL CROPS.

Both the Garland and Frannie divisions were cropped during the season of 1918. The total crop value of the combined area was about \$1,486,000 or an average of \$39.44 per acre. The average for the Garland division was \$41.59 and that for the Frannie \$24.47. Much of the Frannie division was cropped for the first time and many of the crops were not so satisfactory as expected because the farmers for the most part were inexperienced in irrigated farming, the land was raw, and during the first part of the growing season unusually hot, dry weather prevailed.

The total area cropped in 1918 on the Garland and Frannie Divisions was 37,688 acres. The principal crop was alfalfa, having a total area of 14,285 acres and an average value per acre of \$37.27. The amount of land planted in sugar beets was 436 acres less than in 1917, only 338 acres being planted, returning an average of \$48.77 per acre. The area in wheat and oats totaled 18,633 acres, having a total crop value of \$666,837. The highest return per acre in 1918 was received from potatoes, amounting to \$178.30. This encouraged the farmers to increase the potato acreage, and in the spring of 1919, 1,479 acres were planted, but the crop will not net the returns expected as only about half the seed planted germinated.

Crop report, Shoshone project (Garland division), Wyoming, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	14,245	Ton.....	31,257	2.2	\$17.00	\$531,370	\$37.30
Alfalfa seed.....	99	Bushel.....	95	.9	10.00	945	9.56
Barley.....	55	do.....	2,135	38.6	1.25	2,668	48.30
Beans.....	21	do.....	249	11.9	4.00	994	47.56
Beets, sugar.....	388	Ton.....	4,422	11.4	10.00	44,220	114.00
Sweet clover hay.....	61	do.....	175	2.9	17.00	2,975	48.77
Sweet clover seed.....	768	Bushel.....	2,823	3.7	10.00	28,230	36.78
Corn, Indian.....	20	do.....	586	29.4	2.00	1,172	58.99
Corn fodder.....	33	Ton.....	210	6.3	17.00	3,570	107.36
Garden.....	231	do.....	227	.9	17.00	22,878	99.15
Hay.....	254	Ton.....	227	.9	17.00	3,867	15.23
Miscellaneous ¹	6	do.....	775			775	
Oats.....	4,515	Bushel.....	131,732	29.2	1.00	131,730	29.17
Pasture.....	1,836	do.....	40,208			40,208	21.90
Potatoes.....	588	Bushel.....	127,447	217	.85	108,330	184.31
Wheat.....	9,851	do.....	228,813	23.2	1.88	430,168	43.67
Sugar-beet seed.....	46	Pound.....	82,800	1,800	.20	16,560	360.00
Less duplicated areas.....	57						
Total cropped.....	32,960		Total and average.....			1,370,660	41.59
			Areas.		Acres.	No. farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area farms reported		39,764	624	27.00
Nonbearing orchard.....		68	Total irrigated area farms reported		33,552	624	22.80
Young alfalfa.....		1,784	Under water-right applications		33,338	624	22.60
Ground fall plowed.....		379	Under rental contracts.....		60	1	.10
Miscellaneous.....		123	Leased land.....		154	1	.10
Less duplicated areas.....		1,762	Total cropped area farms reported		32,960	624	22.40
Grand total irrigated.....	33,552						

¹ Apples, small fruits, onions, and sunflowers.*Crop report, Shoshone project (Frannie division), Wyoming, year of 1918.*

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	40	Ton.....	60	1.5	\$17.00	\$1,020	\$25.50
Alfalfa seed.....	18	Bushel.....	6	.33	10.00	60	3.33
Barley.....	17	do.....	160	9.41	1.25	200	11.76
Beans.....	51	do.....	100	1.99	4.00	406	7.99
Garden.....	23	do.....	215			2,165	92.92
Hay.....	236	Ton.....	188	.80	20.00	3,770	15.97
Oats.....	1,239	Bushel.....	26,427	21.33	1.00	26,427	21.33
Pasture.....	52	do.....	201			201	3.91
Potatoes.....	34	Bushel.....	3,075	89.18	.85	2,614	75.80
Rye.....	2	do.....	40	20.00	1.49	60	29.80
Wheat.....	3,028	do.....	41,760	13.79	1.88	78,510	25.92
Miscellaneous ¹	7	do.....	287			287	
Less duplicated areas.....	18						
Total cropped.....	4,729		Total and average.....			115,722	24.47
			Areas.		Acres.	Number of farms.	Per cent of project.
Irrigated, no crop:			Irrigable area farms reported.....		7,973	126	5.6
Nonbearing orchard.....		1	Irrigated area farms reported.....		4,730	126	3.3
Young alfalfa.....		1,128	Under water-right applications		4,473	122	3.1
Ground fall plowed.....		390	Under rental contracts and				
Miscellaneous.....		36	leased land.....		257	4	1.8
Less duplicated areas.....		1,554	Cropped area farms reported.....		4,729	126	3.3
Grand total irrigated.....	4,730						

¹ Sugar beets, Indian corn, corn fodder.

PUBLIC NOTICES AND ORDERS.

PUBLIC NOTICE, JULY 17, 1918.

1. **Supplemental construction agreements.**—Under the provisions of the reclamation act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof, or supplementary thereto, particularly section 4 of the reclamation extension act of August 13, 1914 (38 Stat., 686), a majority of the water-right applicants and entrymen in the Garland division of the Shoshone project, have made agreements providing for an increase in the cost of construction in the sum of \$12.50 per irrigable acre. This increased cost is for the building of subsurface drains open and closed for the relief of seeped areas and the protection of areas threatened with seepage within the limits of said Garland division, all of which supplemental construction will involve a cost of not to exceed \$12.50 per irrigable acre of land.

2. **Ratification.**—The said agreements are hereby ratified and confirmed and said increased charge of \$12.50 per irrigable acre is hereby made effective in accordance with the conditions of said agreements and as herein specified.

3. **Lands affected.**—All of the lands within the Garland division of the Shoshone project now or hereafter becoming subject to the terms of said reclamation extension act, whether described in water-right applications heretofore or hereafter made, are subject to said increased charge, as a construction charge; all other lands in said division are subject to said increased charge as an operation and maintenance charge.

4. **Payment of increased charge.**—Said increased charge of \$12.50 per irrigable acre shall be paid as follows:

(a) All water-right applicants and entrymen accepting the terms of said reclamation extension act shall pay the same as a construction charge in additional annual instalments after the expiration of the twenty instalments payable under said extension act and the two additional annual instalments provided in public notice of September 25, 1915, each such instalment in the case of each individual to be not less than the largest of the annual instalments theretofore paid under his water-right application.

(b) All other water-right applicants and entrymen shall pay said increased charge as an additional operation and maintenance charge as follows: 60 cents per irrigable acre on March 1, 1920, and 70 cents per irrigable acre annually thereafter for 17 years.

S. G. HOPKINS,
Assistant Secretary of the Interior.

PUBLIC NOTICE, MARCH 11, 1918.

1. **Annual operation and maintenance charges.**—In pursuance of section 4 of the reclamation act of June 17, 1902 (32 Stat., 388), and of acts amendatory thereof or supplementary thereto, particularly the reclamation extension act of August 13, 1914 (38 Stat., 686), announcement is hereby made that the annual operation and maintenance charge for the irrigation season of 1919, and thereafter until further notice, against all lands of the Shoshone project, Wyoming, under public notice, shall be a minimum charge of \$1.10 per irrigable acre whether water is used thereon or not, under which charge water users will be entitled to receive $1\frac{1}{2}$ acre-feet of water per acre; that

additional water will be furnished up to a limit of one additional acre-foot per irrigable acre at the rate of 25 cents per acre-foot, and all further supply at 50 cents per acre-foot. All operation and maintenance charges will be due and payable on March 1 of each year for the preceding irrigation season; but where water-right application is made for public land entered under the reclamation law after June 15, or where water-right application is made after August 1 for land in private ownership, no operation and maintenance charge will be made for water delivered during the remainder of the irrigation season in which the water-right application is made.

S. G. HOPKINS,
Assistant Secretary of the Interior.

FINANCIAL STATEMENT.

Condensed balance sheet, Shoshone project, June 30, 1919.

Cash.....	\$1,912.55	
Inventories of materials and supplies on hand.....	85,216.46	
Construction contract water-right charges unaccrued.....	3,125,474.83	
Current account receivable.....	25,668.70	
Construction work contracted.....	20,492.68	
Gross construction cost.....	\$6,109,061.20	
Less construction revenue earnings.....	85,374.99	
Net construction cost.....		6,020,686.21
Gross operation and maintenance cost.....	313,602.62	
Less operation and maintenance revenue earnings.....	6,390.39	
		307,272.23
Accounts payable.....		31,682.58
Contingent obligations.....		22,384.56
Collection and contracts of specific accounts for repayments to reclamation fund.....		3,786,397.18
Miscellaneous accruals.....		127,913.00
Capital investment:		
Disbursements, transfers and joint construction vouchers received.....	\$6,631,353.38	
Collections, transfers, refunds, and joint construction vouchers issued.....	1,013,007.04	
Net investment.....		5,618,346.34

Feature cost of Shoshone project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys: Project as a whole.....	\$2,958.15	\$68,375.68
Storage system: Shoshone Dam.....	322,078.51	1,680,504.22
Canal system:		
Garland division—		
Corbett diversion dam.....		97,467.80
Controlling works, Ralston Reservoir.....		17,596.19
Garland Canal headworks.....		16,238.75
Settling basin and spillway.....		23,853.01
Corbett Tunnel.....		1,181,220.12
Sluicing tunnel.....		14,472.72
Garland Canal, division 1.....		342,931.84
Garland Canal, divisions 2 and 4.....		59,873.77
Garland Canal, division 3.....		27,113.41
Crossings under Chicago, Burlington & Quincy R. R.....		11,026.97
Frannie Canal, schedules 1, 2, 3, and 4.....		84,156.83
Garland Flat wells.....		2,130.84
31 reinforced drops, main canal.....		79,510.92
Temporary flume, Alkali Creek.....		8,730.72
Eazlenest crossing and flume.....		53,770.60
Inclined drop, Alkali Creek.....		28,267.10
Frannie division—		
Surveys, main canal.....	1,199.04	19,749.73
Frannie Tunnel portals.....	10.76	8,896.34
Frannie Tunnel proper.....	4,185.25	49,072.70
Frannie main canal, Government forces.....		9,050.31
Frannie main canal contracts.....	16,805.98	152,786.89
Wastewater ditches.....		323.35
Earthwork.....	468.36	6,892.13
Structures.....	22,688.51	75,390.73
Willwood division—Surveys.....	2,429.78	18,078.11
High-line division—Surveys.....	48.52	34,406.67
Oregon Basin—Surveys.....	16,025.60	16,025.60
Total canal system.....	62,463.72	2,439,133.15

¹ Deduct.

Feature cost of Shoshone project—Continued.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Lateral system:		
Garland division—		
Surveys.....		\$9,852.64
Earthwork.....	\$74,159.72	198,689.26
Structures.....	16,792.48	106,286.76
Frannie division—		
Surveys.....	8,049.31	41,892.49
Earthwork.....	41,207.23	159,009.78
Structures.....	106,217.05	341,055.68
Willwood division—Surveys.....	1,082.51	1,958.04
High-line division—Surveys.....		6,903.49
Total lateral system.....	99,188.86	862,648.14
Drainage system:		
Surveys.....	2,439.08	27,393.01
Open drains.....	31,305.60	130,531.23
Closed drains.....	39,606.25	516,782.89
Total drainage system.....	73,350.93	674,707.13
Farm units:		
Garland division—Surveys.....		11,050.77
Frannie division—Surveys.....	2,167.38	10,504.24
Willwood division—Surveys.....	1,815.08	2,636.56
Total farm units.....	3,982.46	24,191.57
Permanent improvements:		
Garland division—		
Buildings.....	2,796.02	16,007.25
Roads and bridges.....		21,932.81
Frannie division—		
Buildings.....	1,426.25	11,611.30
Roads.....		881.22
Water supply.....	4,541.26	24,853.73
Shoshone Dam division—		
Buildings.....	224.46	2,515.67
Roads.....		133,704.77
Total permanent improvements.....	8,987.99	211,506.75
Telephone system:		
Garland division.....	379.72	5,061.11
Frannie division.....	933.15	6,017.00
Shoshone Dam.....		5,758.28
Total telephone system.....	1,312.87	16,856.39
Operation and maintenance during construction.....	3,622.60	21,530.67
Miscellaneous supplemental construction.....		49,269.32
Operation and maintenance transferred to and compounded with construction charges.....		147.75
Total cost of construction features.....	577,946.09	6,048,870.77
Plant account.....		59,243.57
Unadjusted clearing accounts.....		946.86
Gross construction cost to June 30, 1919.....	577,946.09	6,109,061.20
Less revenues earned during construction period:		
Rentals.....	6,698.53	22,949.26
Rental of grazing and farming land.....		3,815.90
Rentals of irrigation water.....		132.00
Rentals of telephone and tolls.....	15.70	241.97
Contractors' freight refunds.....	151.23	19,584.00
Other revenues, unclassified.....	13,511.93	45,710.98
Loss, hospital operations.....	1,511.65	1,577.16
Losses on operations unclassified.....	8,369.99	13,481.96
Subtotal.....	10,211.87	88,374.99
Net construction cost to June 30, 1919.....	567,734.22	6,020,686.21

¹ Deduct.

Statement of cost by calendar years, Shoshone project.

	Construction.	Operation and maintenance under public notice.	Total cost.
1907 (covers period from May 1, 1904, to Dec. 31, 1907).....	\$2,238,120.02		\$2,238,120.02
Year ending Dec. 31—			
1908.....	710,703.60	\$8,808.76	719,512.45
1909.....	413,333.86	15,278.27	428,612.13
1910.....	223,606.61	14,580.19	238,276.90
1911.....	190,108.54	20,525.05	210,633.59
1912.....	189,586.50	22,435.24	212,021.74
1913.....	116,434.16	29,708.59	146,142.75
1914.....	176,764.14	21,377.95	198,142.09
1915.....	213,377.99	23,186.20	236,564.19
1916.....	299,283.07	28,531.71	327,814.78
1917.....	552,096.55	35,583.88	587,680.43
1918.....	300,964.70	62,353.38	363,318.08
June 30, 1919.....	424,400.94	28,342.26	452,743.20
Subtotal.....	6,048,870.77	310,711.48	6,359,582.25
Unadjusted clearing accounts.....	946.86		946.86
Undistributed plant accounts.....	59,243.57	2,891.14	62,134.71
Total.....	6,109,061.20	313,602.62	6,422,663.82

Statement of costs by fiscal years, Shoshone project.

	Construction.	Operation and maintenance under public notice.	Total cost.
1907 (covers period from May 1, 1904, to June 30, 1907).....	\$1,601,311.42		\$1,601,311.42
Year ending June 30—			
1908.....	1,064,541.82	\$5,274.65	1,069,816.47
1909.....	412,384.78	8,913.31	421,298.09
1910.....	439,389.17	16,711.14	456,100.31
1911.....	205,630.95	17,982.75	223,613.70
1912.....	121,766.29	20,917.99	142,684.28
1913.....	154,406.51	24,908.23	179,314.74
1914.....	149,693.27	30,040.27	179,733.54
1915.....	234,715.56	18,588.25	253,303.81
1916.....	217,357.16	25,695.79	243,052.95
1917.....	412,260.17	33,255.51	445,515.68
1918.....	467,467.58	51,423.24	518,890.82
1919.....	577,946.09	57,000.35	634,946.44
Subtotal.....	6,048,870.77	310,711.48	6,359,582.25
Unadjusted clearing accounts.....	946.86		946.86
Unadjusted plant accounts.....	59,243.57	2,891.14	62,134.71
Total.....	6,109,061.20	313,602.62	6,422,663.82

Estimated cost of contemplated work, Shoshone project, during fiscal year 1921

Features.	Sub- feature.	Principal feature.
Examinations and surveys: Extensions of project		\$500
Canal system: Frannie division—		
Frannie Canal third unit extension—earthwork	\$33,080	
Frannie Canal third unit extension—structures	16,300	
Frannie Canal—priming and puddling	1,500	
		50,880
Lateral system:		
Frannie division—		
Surveys—Location	2,000	
Laterals and sublaterals, third unit, earthwork	18,000	
Laterals and sublaterals, second unit, puddling and priming	3,000	
Structures—Second and third units	40,000	
Waste-water recovery	2,000	
Willwood division—Surveys and office work	1,000	
		66,000
Drainage:		
Garland division—Surveys, investigations, and construction of drains under supplemental construction	82,000	
Frannie division—Surveys, investigations, and construction of Howell drain under original construction	18,000	
		100,000
Flood protection: Frannie division—Improvement of Sage Creek Channel		11,000
Farm units:		
Frannie division—Surveys and office work, third unit	2,000	
Willwood division—Surveys and office work	500	
		2,500
Permanent improvements:		
Powell headquarters office	22,000	
Garland division—Addition to cottages	500	
Frannie division—Addition to cottages	300	
Pole Cat Creek bridge	1,700	
		24,500
Telephone system—Frannie division extensions		1,000
Operation and maintenance, public notice:		
Garland division—		
Operation	20,000	
Maintenance	32,000	
Frannie division—		
Operation	12,000	
Maintenance	16,000	
		80,000
Reimbursable accounts		1,500
Total		337,800

Operating costs and revenues, Shoshone project, to Dec. 31, 1918.

	Calendar year 1918.			To end of calendar year 1918.		
	Operation.	Maintenance.	Total.	Operation.	Maintenance.	Total.
COSTS.						
Storage works:						
Shoshone Dam and Reservoir	\$7,743.33	\$341.85	\$8,085.18	\$23,859.02	\$11,837.22	\$35,696.24
Maintenance of buildings					158.91	158.91
Shoshone Reservoir highway					196.83	196.83
	7,743.33	341.85	8,085.18	23,859.02	12,192.96	36,051.98
Canal system:						
Garland, divisions 1 and 2	1,233.34	1,678.59	2,911.93	24,103.48	17,467.16	41,570.64
Garland, divisions 3 and 4	11.80	1,035.93	1,047.73	1,857.75	7,180.72	9,038.47
Frannie, Garland division	35.23	774.99	810.22	1,706.44	1,559.59	3,266.03
Frannie, Frannie division	315.36	182.25	497.61	315.36	182.25	497.61
Corbett diversion dam	1,412.84	990.85	2,403.69	3,804.01	1,168.61	4,972.62
Relining Corbett Tunnel		8,246.42	8,246.42		9,029.11	9,029.11
Ralston tower					316.35	316.35
Maintenance bridges, main canal					261.63	261.63
	3,008.57	12,909.03	15,917.60	31,787.04	37,165.42	68,952.46
Lateral system:						
Garland division—						
Distribution system	11,398.87	14,756.25	26,155.12	75,719.16	73,050.07	148,769.23
Buildings, Garland flat		59.03	59.03		354.78	354.78
Surface drains		407.34	407.34	74.58	2,565.29	2,639.97
Recapturing waste water	303.81		303.81	303.81		303.81
Determining seeped areas					1,505.62	1,505.62
Bridges, culverts, and roads					862.14	862.14
Frannie division—						
Distribution system	6,245.94	4,225.69	10,471.63	6,245.94	4,225.69	10,471.63
	17,948.62	19,448.31	37,396.93	82,343.59	82,563.59	164,907.18
Drainage:						
Open drains		1,400.19	1,400.19	861.40	3,683.60	4,545.00
Closed drains		1,302.00	1,302.00	1,169.38	5,706.76	6,876.14
		2,702.19	2,702.19	2,030.78	9,390.36	11,421.14
Undistributed expenses:						
Telephone operation and maintenance					532.12	532.12
Farming operations					652.09	652.09
Total.	28,700.52	35,401.38	64,101.90	140,020.43	142,496.54	282,516.97
Accrued operation and maintenance charges added to construction						147.75
						282,664.72
REVENUES.						
Operation and maintenance charges accrued on contracts with water-right applicants					158,628.52	244,098.34
Operation and maintenance charges paid in advance by water-right applicants					44.09	327.42
Operation and maintenance charges paid and forfeited by water-right applicants						1,640.91
Penalties on operation and maintenance charges accrued on contracts with water-right applicants					107.62	2,004.35
Rental of lands and buildings during operation period					147.25	536.26
Rental of irrigation water					446.00	4,386.98
Miscellaneous revenues					13.00	13.00
Less discount allowed on operation and maintenance charges accrued on contracts with water-right applicants (contra)					3.94	2,262.36
Total.					59,390.42	250,744.90
Difference (deficit)					4,711.48	31,919.82

¹ Taken up on January bill register. ² Adjustment on September repayment journal. ³ Deduct.

SECONDARY PROJECTS AND PROPOSED PROJECT EXTENSIONS.

(A description of secondary projects can be found in the Fifteenth Annual Report, pp. 508 to 546; Sixteenth Annual Report, pp. 348 to 363; and Seventeenth Annual Report, pp. 381 to 406. Only those projects on which work has been done during the fiscal year 1919 are discussed in this report.)

ARIZONA.

PARADISE-VERDE.

The Paradise-Verde irrigation district organized under the laws of Arizona, proposes to irrigate some 95,000 acres of land by water from the Verde River, Cave Creek, and New River with storage in the Camp Verde, Horseshoe, and other reservoir sites. Of the land to be reclaimed 49,600 acres are in private ownership, 30,460 acres entered public land, 1,238 acres unentered public land, and 14,769 acres State land.

The irrigation district, has presented its maps and plans of reclamation to the department with a petition that they be approved under the terms of the act of August 11, 1916 (39 Stat. 506), which provides that the cost of “* * * any irrigation project under said irrigation district laws shall be equitably apportioned among lands held under private ownership, lands legally covered by unpatented entries, and unentered public lands included in said irrigation district.” As there is a large area of public lands within the district, the Commissioner of the General Land Office and the Solicitor of the Interior Department requested the Reclamation Service to make a report on the water supply, area of public lands that would be directly benefited, and the general feasibility of this project. In compliance with this request, Consulting Engineer Homer Hamlin made an investigation and reached the conclusion that the water supply available was inadequate for the proposed project and that the cost of constructing the necessary irrigation works would be excessive.

SENTINEL PROJECT.

This project contemplates a storage reservoir on the Gila River and a canal on each side of the stream at elevations of from 25 to 50 feet above the normal water level for the irrigation by gravity of a large body of irrigable land in Yuma and Maricopa Counties, Ariz. During the past year soil surveys of the irrigable area and test borings at the proposed damsite have been made by the Reclamation Service. The soil survey covered a gross area of 633,500 acres, of which 131,600 acres are too rough and stony to be of any agricultural value.

In the vicinity of Sentinel, with the exception of the sand-blown material, the soil is generally cemented gravel below an average depth of about 12 inches, and this condition extends to a depth of from 8 to 25 feet. Other portions of the project are covered with sand dunes that are classed as nonagricultural. Of the total area examined, 369,300 acres are classed as nonirrigable and 264,200 acres as agricultural.

At the proposed damsite, located about 12 miles above the town of Sentinel, the Gila River cuts through a lava formation for about 4,000 feet, forming a canyon about 100 feet deep and 400 feet wide. Test borings at the damsite demonstrate that suitable foundations for a masonry structure do not exist. One drill hole located 150 feet from the canyon wall shows a lava blanket 51 feet thick, followed by 2 feet of clay, 9 feet of cemented gravel and 138 feet of sand and silt. With the exception of occasional lava boulders, only sand, gravel, clay, and silt are found in any of the other borings. The great expense of storage at this point, added to the cost of constructing distribution systems, would probably be prohibitive.

YUMA PROJECT, YUMA MESA EXTENSION.

Lying to the east of the present Yuma project there are 45,000 acres of mesa land susceptible of irrigation by pumping; 33,000 acres of this land are in public ownership, 8,000 acres are privately owned, and 4,000 acres are State land.

It is proposed to irrigate the Yuma mesa extension from three pumping plants located along the east main canal in the Yuma Valley, with a small additional auxiliary plant on the mesa. The power for operating the pumps will be generated at power plants located at the siphon drop on the main canal and at Araz. Preliminary surveys have been completed and farm unit plats prepared. None of the public land has yet been sold and various phases of the project are still under investigation. A soil examination of the mesa has been made by Prof. Charles F. Shore of the University of California, who reaches the conclusion that under irrigation the mesa should become an important citrus producing section.

CALIFORNIA.

IMPERIAL VALLEY, ALL-AMERICAN CANAL PROJECT.

In cooperation with the Imperial irrigation district, the proposed All-American Canal has been investigated in conformity with a general plan outlined by Engineers C. E. Grunsky, Elwood Mead, and W. W. Schlecht. The proposed canal diverts from the Colorado River at the Laguna Dam of the Yuma project and provides for the irrigation of approximately 900,000 acres of land in the Imperial Valley, 515,000 acres of which are included in the Imperial irrigation district, the remainder, mostly public lands, being located above existing canals.

The constructed canal of the Imperial irrigation district diverts from the Colorado River about $1\frac{1}{2}$ miles north of the international boundary line, passes Pilot Knob and, in order to avoid deep cuts through a sandhill area, enters and passes through Mexico for a distance of about 50 miles. For this diversion a temporary dam has to be constructed practically every year, which is an item of heavy expense and a serious menace to the Imperial Valley and the Yuma project built by the United States. These dams have not proved wholly effective and the operation of a canal line through Mexico is a more or less serious problem. It is for the purpose of overcoming these difficulties and to carry a water supply to a large area of higher land that the construction of the All-American Canal is proposed. Under the terms of an agreement between the Secretary of the Interior

and the Imperial irrigation district, surveys of the All-American Canal were commenced in March, 1918, under the direct supervision of Mr. Porter J. Preston. The proposed canal heads at the Laguna Dam and follows the present main canal of the Yuma project for a distance of 10 miles to siphon drop, about 4 miles north of the town of Yuma. The plans call for increasing the capacity of the Yuma main canal from 1,600 second feet to 10,600 second-feet. From siphon drop, the survey runs in a southwesterly direction past Pilot Knob and the present heading of the Imperial Canal to within 400 feet of the international boundary line, which it parallels for 4 miles well into the sand area where it turns northwest through the sandhills beyond which the line follows the general contour of the country in a westerly direction, passing north of Calexico, crossing New River and finally terminating in the main canal now constructed on the west side of the Imperial Valley. The total length of the proposed line from Laguna Dam is a little over 76 miles. For 28.8 miles after leaving siphon drop, it has a capacity of 9,000 second feet. Throughout the remainder of its length, the capacity is gradually reduced on account of contemplated diversions and probable canal losses until the lower section of a little over 13 miles carries but 1,500 second feet. As now planned, the bottom width of the canal varies from 164 feet maximum to a minimum of 46½ feet. Westward from Araz until the sandhill area is passed, the work will be exceptionally heavy. In the construction of the 76 miles of canal, it is estimated that 65,500,000 cubic yards of earth and 4,300,000 cubic yards of rock will be excavated; 1,040,000 square feet of concrete lining will be required, and numerous expensive structures will have to be built.

IRON CANYON PROJECT.

An account of this project will be found on page 510 of the Fifteenth Annual Report. Since the investigations of 1914, the development of rice culture in the Sacramento Valley has so modified the conditions existing a few years ago that it has been deemed advisable to make a further examination of this project, and for that purpose a cooperative agreement has been entered into between the Reclamation Service, the Iron Canyon Project Association, and the board of control of the engineering department of the State of California. At a conference of representatives of the various parties to this agreement, a tentative scheme for work was formulated, which called for a thorough exploration of the damsite, location of the main canal to fix the western boundary of the irrigable area, classification of lands, and office studies of water supply, duty of water, and the effect the construction of the project would have upon flood conditions and navigation. The Reclamation Service has undertaken the investigation of the Iron Canyon damsite and the State engineer the survey of the main canal and the study of water supply. Preparatory work was taken up in May under the direction of Mr. Homer J. Gault and diamond drilling was commenced in June, one hole being sunk to a depth of 113 feet. The first 71 feet were in lava rock which was followed by a conglomerate for 41 feet. Below the conglomerate sand was encountered.

Field work on the location of the main canal was commenced at Red Bluff during the month of June under the direction of Mr. J. E.

Temple. The canal line is being run south from Red Bluff to determine the western boundary of an irrigation district being formed to include lands in Tehama County. At the end of the fiscal year 15 miles of level and transit line had been completed. Investigations are still in progress.

ORLAND PROJECT EXTENSION.

Lying to the south and west of the present Orland project there are 30,000 acres of privately owned agricultural land which it is proposed to irrigate by the construction of a dam across Stony Gorge Creek, impounding approximately 105,000 acre-feet of water, the enlargement of the present south canal of the Orland project, and the construction of an extension following the western boundary of the new land to be irrigated. The survey of the irrigable area, including the layout of the distributing system, has been completed and diamond drill borings have been made at the proposed Stony Gorge damsite. Preliminary designs for structures and other studies are being made upon which to base an estimate of cost.

CALIFORNIA RECONNOISSANCE, WARNER'S RANCH PROJECT.

A hasty field examination and study of available data relative to the possibilities of new irrigation development in San Diego County by storing the flow of the upper San Luis Rey River in Warner's Ranch Reservoir was made by Consulting Engineer Hamlin. More extensive investigation of the water supply available, the area, or areas, to which the stored water could be most economically and advantageously applied, and the probable cost per acre irrigated are required in order to determine the feasibility of this project.

DIXON (PUTAH CREEK) PROJECT.

About 50,000 acres of land are susceptible of irrigation from Putah Creek in Solano County. Tentative plans for reclamation contemplate the regulation of the river discharge by the construction of a reservoir south and east of the town of Monticello and a distributing system diverting from the stream near Winters. At the present time, some 5,600 acres are irrigated by pumping plants; the remainder of the area is dry-farmed. All of the land is in private ownership and more than half of it is held in tracts exceeding 160 acres. No field surveys have been made by the Reclamation Service in connection with this project.

OTHER PROJECTS.

Reports have been received from the project manager of the Orland project upon supplying additional reservoir facilities and the possible extension of the following irrigation districts and other constructed, or partially constructed, projects in California: Oakdale, South San Joaquin, Turlock and Modesto irrigation districts, Woodbridge, Wheatland, Brown's Valley, Surprise Valley, Happy Valley, and the Excelsior Mining & Water Co.'s irrigation system; also on the possible development of the Yuba River watershed, including the Oregon House, Virginia Ranch, Tennessee Creek, and Homcut reservoir sites. These investigations are purely preliminary, being based upon a hasty field inspection and an examination of data accumulated from various sources.

COLORADO.**DOLORES PROJECT.**

Between 1907 and 1912 various investigations were made by private interests for the development of approximately 200,000 acres of land in Montezuma and Dolores Counties, Colo., and San Juan County, Utah. No construction work, however, was ever undertaken, the promoters being unable to secure the necessary funds. In the summer of 1918, the possibilities of development in this section were called to the attention of the Reclamation Service by the Durango Exchange and preliminary surveys have been made of the proposed damsite and main canal leading from the Dolores River into the San Juan River Basin.

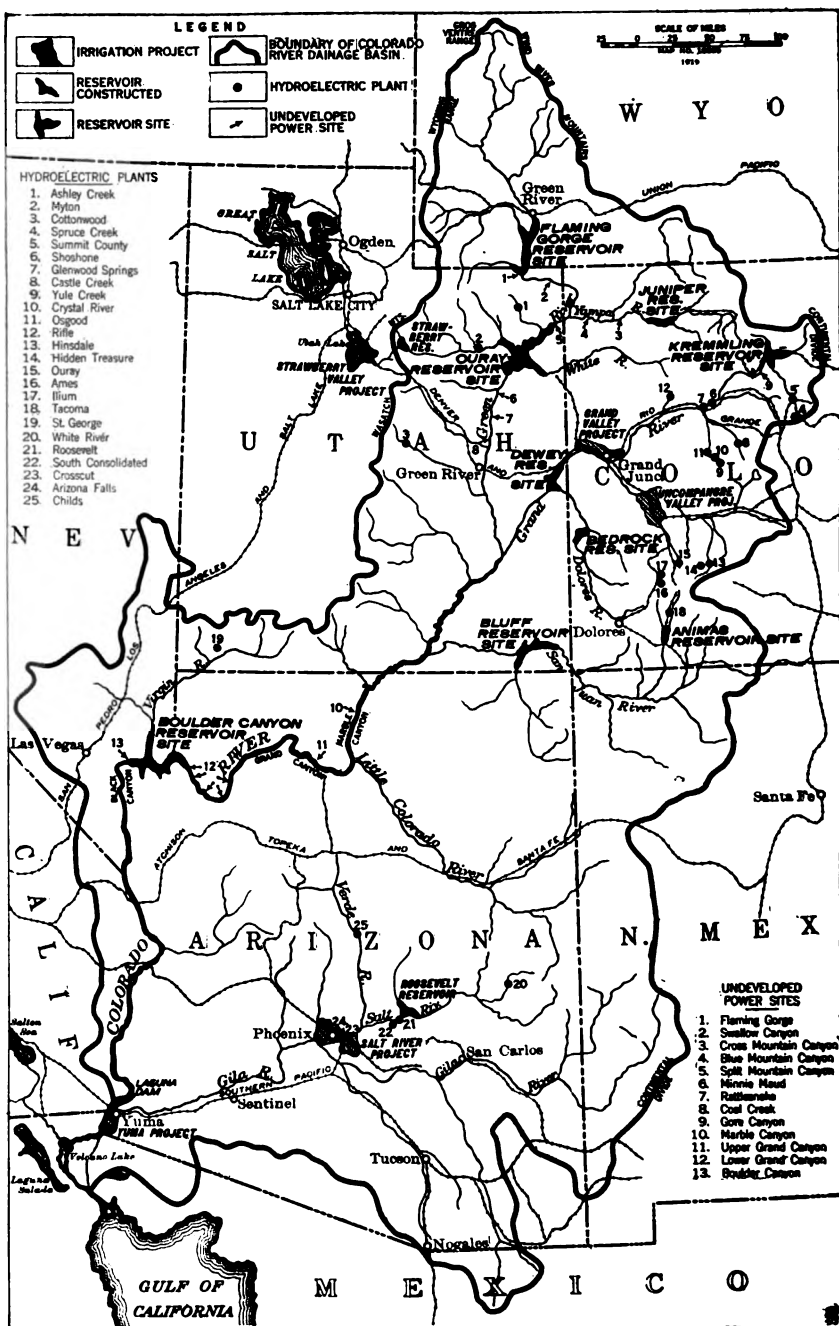
The development of this project requires the construction of a combination diversion and storage dam across the Dolores River about one-half mile below the mouth of Beaver Creek. The height of this dam above the river bed will be 230 feet, the diversion being 173 feet above the stream; 47 feet of storage are provided for above the gate seats. With a water depth of 220 feet at the dam, the capacity of the reservoir will be 258,000 acre-feet, of which 120,000 acre-feet will be available for irrigation. The reservoir created by the construction of this dam will flood 13,700 acres of land, 2,800 acres of which are in private ownership.

From the damsite the location of the main canal follows a very steep hillside for $13\frac{1}{2}$ miles where it passes through the divide between the Dolores and San Juan Basins by means of a tunnel 4,800 feet long. Practically all of this canal will be in sand rock and 3,300 linear feet of flume will be required for crossing numerous narrow canyons. In addition to the tunnel through the divide there are two other tunnels aggregating 460 feet in length; two siphons $8\frac{1}{2}$ feet in diameter aggregating 2,010 feet in length, one under a maximum head of 150 feet and the other under a head of 300 feet, will be needed.

A study of the water supply available shows that after providing for prior appropriations water is available for only about 50,000 acres. Most of the area to be irrigated is covered by homestead entries and squatters' claims under the enlarged homestead laws. These settlers have met with a moderate degree of success in dry farming; yields of from 10 to 15 bushels of wheat and 10 bushels of corn per acre have been obtained in some instances.

MONTEZUMA PROJECT.

This project covers some 50,000 acres of irrigable land most of which is included in the Montezuma irrigation district, organized in 1901 under the laws of Colorado. At the present time about 25,000 acres are irrigated more or less successfully, the water supply usually being deficient after the middle of July. The district has an outstanding indebtedness of approximately \$1,000,000, and has defaulted in the payment of both principal and interest. Its irrigation works are in poor condition and can not be operated much longer without extensive repairs and replacements. The present revenues of the district are little in excess of operating expenses and it is unable to borrow money for necessary repairs or to provide a water supply for the uncultivated lands.



COLORADO RIVER BASIN.**STORAGE FOR IRRIGATION AND RIVER CONTROL.**

Summary of Report by John T. Whistler, Engineer, U. S. R. S.

The Colorado River is formed by the junction of the Green and Grand Rivers in eastern Utah. The Green, which may be considered as its upper continuation, rises in western Wyoming, flows in a general southerly direction to the Utah line, swings across the north-eastern corner of that State into Colorado, and back into Utah. Its principal tributaries are Blacks Fork, Henrys Fork, Yampa River, Ashley Creek, Duchesne River, White River, Minnie Maud Creek, Price River and San Rafael River. The length of the Green is approximately 700 miles.

Grand River rises in north central Colorado, and flows across Colorado and eastern Utah in a general southwesterly direction to the junction with the Green. Its length is about 423 miles and its principal tributaries are Frazer, Blue, Eagle, Williams and Roaring Forks and the Gunnison River.

Below the junction the Colorado flows southwesterly into Arizona, across the northwest corner of that State, and then turning south forms the boundary between Arizona on the east and Nevada, California, and Mexico on the west, flowing into the Gulf of California about 119 miles below Yuma. The principal tributaries below the junction of the Green and Grand are Fremont, Escalante, and Paria Rivers, Kanab Creek and Virgin River from the west, and San Juan, Little Colorado, Williams, and Gila Rivers from the east.

Including the Green, the total length of the Colorado is about 1,700 miles. It drains an area of 244,000 square miles, comprising about one-thirteenth of the total area of the United States south of the Canadian line. The population of the basin in 1915 was estimated at 457,000.

The lower third of the basin is a desert composed of hot, arid, low-lying plains and valleys, broken here and there by occasional mountain ranges rising to elevation of 2,000 to 6,000 feet. A line of cliffs hundreds and often thousands of feet in height bounds this part of the basin on the northeast, above which we find a vast plateau, the general elevation of which is from 5,000 to 8,000 feet. Through this tableland for more than a thousand miles the river has cut a narrow gorge, in places over a mile deep. Every tributary throughout this region has cut its canyon, each river and creek entering these has cut another, so that much of the upper part of the basin is traversed by a labyrinth of deep gorges.

The rim of the basin, whence the streams take their sources, is made up of high mountain ranges; on the north and east the Wind River Mountains and the ranges of the Continental Divide, on the north and west the Gros Ventre and Wyoming Mountains and the Wasatch Range. Here the snows accumulated through the winter melt with the advancing season, bringing on the annual June floods in the lower river.

At its mouth the river has built up a great delta cone which, as it encroached upon the ancient arm of the sea now known as the Gulf of California, finally cut off its upper end entirely. This upper end, at first an inland sea, is now the Salton Basin, the irrigated portion of

which, known as the Imperial Valley, rivals the Nile Valley itself as a source of agricultural wealth.

INTERNATIONAL AND INTERSTATE INTERESTS IN COLORADO RIVER.

The Colorado River, about 50 miles above its entrance to the Gulf of California, forms the international boundary between the United States and Mexico for a distance of about 25 miles northward along its course. The first treaty with Mexico relating to Colorado River, that of Guadalupe Hidalgo, made in 1848, provided for the maintenance of the Lower Colorado River as a navigable stream.

There are over 75,000 acres of land now irrigated below the international boundary line from the Colorado River, and there is said to be in round numbers a total of half a million acres of irrigable land in the Colorado delta in Mexico. These lands, if brought under full development, must receive their water supply from the Colorado River, whose low summer flow is insufficient in occasional low seasons for the lands now under irrigation in the Imperial Valley in California and Mexico.

Little need be said at this time of the predominating interests of the United States in the Colorado River, as these interests include a water supply for four constructed projects of the Reclamation Service as well as the total interests of the individual States themselves.

The Colorado River and its tributaries drain portions of seven States and these tributaries are the present source of supply for the irrigation of about 1,500,000 acres of land in Wyoming, Utah, Colorado, New Mexico, Arizona, and Nevada. The seventh State, California, is vitally interested in the Colorado River, the present source of supply for irrigating approximately 400,000 acres of land, on lower Colorado River, the lower portion of which is in California. There are over 1,000,000 acres of additional irrigable area in California along Colorado River and in Imperial Valley, which must receive its irrigation supply from Colorado River.

Up to the present time there has been little shortage of water in the various States concerned in the tributaries of the Colorado River. These States are beginning to view with alarmed interest the gradually increasing requirements on the Lower Colorado River. The experience of some of these States in litigation that has arisen over the use of water from streams outside of the Colorado River basin itself, does not tend to lessen the concern with which these States view this increasing use of the Colorado River for irrigation.

It is not necessary at this time to go into a discussion of the irrigation laws of the various States, more than to call attention to the fact that many of these laws are intended for the protection of each State and its interests in the use of its waters as against the use of these waters after they have passed beyond the confines of the State. As the waters of the Colorado River become in greater demand in the future, which they are certain to do, it is obvious that there will result a great economic loss in costly litigation, unless the various States can be assured of no interference of their future requirements by some system of well devised storage plans which will so conserve the water that there will be an irrigation supply for all interested parties.

PROBLEMS BROUGHT OUT.

The salient features developed by investigation in the Colorado River Basin prior to the fiscal year 1919 may be discussed under the following subjects:

Navigation interests have become of admittedly minor importance. From the time of the establishment of the military post at Fort Yuma until the Southern Pacific Railroad reached that point in 1877 there was considerable navigation of the Colorado River from its mouth to Black Canyon. For a time thereafter attempts were made to bring ores from mines in the vicinity of Mohave to Yuma by boats; but without much commercial success. Navigation has long since been practically abandoned, due to the better facilities provided by the railroads. Practically the only use now made of the river is for steamers and dredges engaged in channel improvements and keeping open channels to the various diversions.

Flood control by levees.—The Colorado River, below the Gila, has a mean annual content of approximately 214,000,000 tons of dry silt, the equivalent of 114,000 acre-feet of deposited sediment on the basis of 1 cubic foot of deposited silt weighing 86 pounds. This has resulted in the building up of a fan-shaped, alluvial cone, the crest of which may be said to extend from Pilot Knob near Yuma to Cerro Prieto at the northwest corner of Volcano Lake. To the northwest of this line lies the Imperial Valley, the greater portion of which is below sea level. Salton Sea occupies the lowest portion, having a surface elevation of 240 feet below sea level in October, 1916, with its deepest bottom 287 feet below sea level.

Before any irrigation development had been undertaken in the Imperial Valley, the Colorado River annually overflowed its banks and during the summer flood of 1891 large quantities of water found their way to Salton Sink through the Alamo and New River Channel. Active irrigation developments began about 1900, the first water deliveries being to Mexican lands in 1901. From this time, the Colorado gave little trouble from floods until the flood of 1905, when a break occurred around the Mexican heading of Imperial canal. By this time several towns had been built in the Imperial Valley, a branch of the Southern Pacific Railroad had been built, and several million dollars invested. It appeared that this investment would be entirely lost unless the break could be closed. It was finally closed in 1907, at an estimated cost of over \$2,000,000.

From 1909 to 1912 the Yuma project, which was started in 1904 spent a total of about \$240,000 or \$60,000 annually for levee protection from Laguna Dam along both sides of the river for a distance of 45 miles.

From the beginning of the levee construction to the year 1916 there were built a total of 115.6 miles of levees, at an estimated cost of \$7,450,000, of which \$3,250,000 has been spent by the United States Government in constructing the west side and east levees of the Yuma project and the Ockerson levee. The balance, \$4,200,000, has been spent largely by the California Development Co. and its Mexican subsidiary company.

Flood control by storage.—No serious attempts have been made until recently to investigate the possibility of controlling the Colorado River by means of storage or regulating reservoirs. This subject

has received a great deal of attention in the past in discussions of Ohio and Mississippi River flood problems. It is generally conceded, in the case of the Mississippi that such plans are not feasible, and probably for this reason the subject of flood control has not been given the attention it deserves in dealing with the flood problems of Colorado. Recently plans have been approved for regulating reservoirs in the Miami and Dayton conservancy districts of the Ohio, and construction work is now being prosecuted.

It may be said that practically all investigations of the Reclamation Service for storage sites in Colorado River Basin have been made with a view of providing large storage capacities on the upper rivers that would incidentally control, in part at least, the floods of the lower Colorado River and thus remove to a great extent the expense of levee protection. The important sites investigated, together with the principal data concerning them, are shown in the following table. The capacities given are not maximum capacities but rather those capacities which are limited by feasible height of dam, available water supply, and in some cases by considerations of valuable property which would be destroyed by any further rise of reservoir surface. For location of reservoir sites, see map on page 390.

Storage reservoir sites in Colorado River Basin.

Reservoir.	Stream.	Height of dam. ¹	Capacity.	Probable cost per acre-foot of capacity. ²
		<i>Feet.</i>	<i>Acre-feet.</i>	
Flaming Gorge.....	Green River, Utah and Wyo.....	225	3,500,000	\$5.00
Juniper.....	Yampa River, Colo.....	200	1,550,000	4.00
Ouray.....	Green River, Utah.....	170	10,000,000	5.00
Kremmling.....	Grand River, Colo.....	230	2,200,000	8.00
Dewey.....	Grand River, Utah.....	215	2,270,000	5.00
Bedrock.....	Dolores River, Colo.....	210	800,000	12.00
Animas.....	Animas River, Colo.....	110	440,000	20.00
Bluff.....	San Juan River, Utah.....	206	1,350,000	8.00
Total.....			22,110,000	

¹ Height of spillway above low-water surface.

² Estimates of cost have been increased to meet the present high cost of construction, but must be considered as merely preliminary and subject to change.

Although dam-site borings have not been made for all of the reservoir sites listed in the preceding table, there seems no doubt that there are feasible reservoir sites of sufficient capacity to regulate the Green, Grand, and San Juan Rivers—at least within the probable future irrigation demands.

Water supply.—It is estimated from the data collected that the mean discharge of the Colorado River at Laguna Dam for the 22-year period, 1895 to 1916, inclusive, was 16,145,000 acre-feet. The variation during this period has ranged from about 8,000,000 acre-feet in 1902 to a little over 25,000,000 acre-feet in 1909. Estimates of the discharge of the Green, Grand, and San Juan for the years 1899 to 1916, inclusive, give the following results:

<i>Mean yearly discharge.</i>	<i>Acre-feet.</i>
Green River at Ouray Dam site.....	5,373,000
Grand River at Dewey Dam site.....	6,820,000
San Juan River at Bluff, Utah.....	2,300,000
Total.....	14,493,000

The mean annual discharge of the Gila near Yuma for the 13-year period 1903-1915, inclusive, was 900,000 acre-feet.

Distribution of irrigable areas.—A general report on the lower Colorado River following preliminary investigation by the Reclamation Service in 1915 shows the irrigated area in the lower basin to be 463,480 acres and the total area that may be irrigated 2,349,770 acres. The lower Colorado River area was divided into five divisions for convenience. The first three divisions, including lands along Colorado River from Cottonwood Island to Laguna Dam, include 24,105 acres of irrigated lands and a total of 190,670 acres of irrigable land. The fourth division includes the Yuma project and Sonora lands in Mexico east of Bee River and Hardys Channel of the Colorado River; the irrigated area is shown to be 27,975 acres, all in the Yuma project, and the total area that may be irrigated 647,300 acres. The fifth division includes the Imperial Valley in California and in Mexico; 411,400 acres were irrigated in 1916 and 1,502,800 acres are estimated as the total area which may be irrigated.

Investigations carried out in the upper Colorado River Basin by the Reclamation Service in 1916 covered the Yampa and White River Basins in Colorado, the Uinta Basin in Utah, Dolores Valley in Colorado, and San Juan River Basin in Colorado and New Mexico, and indicate that the total ultimate irrigable area in the entire Colorado River Basin in the United States is 4,442,600 acres and in Mexico 794,400, making a total of 5,237,000 acres for the entire basin. A table showing the distribution of this area by States is given on page 399.

Diversions from the Colorado River Basin.—Diversions which would amount to 7.3 per cent of the August and September flow of the Grand River at Palisades have been planned from the headwaters of that stream into the South Platte and Arkansas River Basin in Colorado. The proposed diversion from the Green and Virgin River Basins in Utah to the Great Basin plan the ultimate diversion of 120,000 acre-feet, including the diversion of 90,000 acre-feet through the Strawberry Tunnel. The total decrease in the available water supply of the Colorado River Basin due to these diversions is estimated at 140,000 acre-feet.

Regulating storage for flood control only.—Studies have been made of the use of Bluff Reservoir on the San Juan and of Dewey Reservoir on the lower Grand River for flood regulation only, and consideration has been given to a reservoir in Boulder Canyon as a flood regulator to control the flashy floods to which the river is subject from its tributaries between that point and the proposed storage reservoirs above. At the Sentinel site a reservoir has been considered for the control of the entire flow of the Gila River at that point.

Silt problem.—The mean silt load of the Colorado River, including the Gila River, is over 200,000,000 tons of silt per year. If this silt were all diverted through the present canals it would build up the present irrigated area of 463,000 acres approximately 3 inches per year. If this silt load were deposited over the total irrigable area of 2,350,000 acres in the lower Colorado River Basin, the yearly accretion would be a little over a half inch (0.58 inch).

No direct determinations have been made of the silt content of the Gila River near its mouth. A discussion of the silt carried by the Gila River is contained in a report on the Sentinel Reservoir site,

wherein it is concluded that the Gila silt content for the period 1909 to 1916, inclusive, was approximately 2 per cent by weight or 1.4 per cent by volume and that the Gila in extreme high-water periods, such as occurred in January and February of 1916, probably discharges about 1 per cent of silt by volume.

Difficulties of maintaining diversions on the Colorado River below Laguna Dam will probably result in diversions being made for the Imperial Valley lands now under irrigation and for further irrigation developments either from Laguna Dam or above that point. In this case the large silt discharge from Gila River will not affect future irrigation development.

Proceeding up the main Colorado River, it is known that the lower tributaries, such as Williams River, Virgin River, Kanab Creek, and Little Colorado River, discharge great quantities of silt in proportion to their run-off.

The San Juan River, with its estimated mean yearly run-off of 2,300,000 acre-feet, carries immense loads of silt, as determined by silt measurements made in 1914, 1915, and 1917. These show that the mean silt content by weight is 14,100 parts in 1,000,000 for the period March, 1917, to July 18, 1917, and that the total acre-feet of silt carried during that time on the basis of 86 pounds per cubic foot of silt is 21,770 acre-feet, or over 40,000,000 tons.

It therefore seems obvious that so far as the Colorado River tributaries so far mentioned are concerned, storage sites for irrigation, if utilized at all, must be near the headwaters of these streams where they emerge from the mountains.

The silt problem for storage sites on the Grand and Green Rivers will not be so serious, although along the lower courses of these streams, if storage sites are feasible for irrigation development, they must have a considerable excess capacity to take care of silt deposits

PROPOSED PLAN OF FUTURE DEVELOPMENT.

Green River Basin, Wyo., has been the subject of two preliminary reports and a more exhaustive cooperative report by John F. Richardson, representing the Reclamation Service, and H. A. True, jr. representing the State of Wyoming. Studying the conclusions of these reports, it is deduced that the gross irrigable area of the Green River Basin in Wyoming best suited to future development is 500,000 acres. To these figures may be added acreage for two uncompleted Carey Act projects on Blacks Fork amounting to 60,000 acres, making a gross total of 560,000 acres of possible new development. The net irrigable area under the most favorable circumstances would probably be not over 85 per cent of this amount, or approximately 475,000 acres.

In any region such as this, where the cost of construction to the most favorably situated tracts will probably equal the value which irrigation will add to the land, many areas which under more favorable circumstances would be served by special distributing structures, such as inverted siphons and flumes, will, on account of the cost, have to be eliminated. It appears more reasonable, therefore, to estimate that not over 60 per cent of the gross area of 560,000 acres or 340,000 acres probably more nearly represents the area which may be economically developed in the future.

Assuming that 60 per cent of the 388,000 acres of undeveloped Carey Act lands, or 230,000 acres, will require 2.15 acre-feet per annum at diversion as heretofore outlined and that the balance, or 110,000 acres to make up the 340,000 acres, will require 3 acre-feet per acre on account of losses from longer supply canals and storage losses, the diversion requirement will be 825,000 acre-feet each year for the 340,000 acres. Assuming a 20 per cent return flow from this amount, the net use or loss to Green River would be 660,000 acre-feet. The mean yearly discharge at Bridgeport, Utah, just below the Utah-Wyoming State line, is estimated to be approximately 2,080,000 acre-feet. With full development of the additional 340,000 acres in Wyoming, the mean yearly supply from Green River at Bridgeport available for storage or for use on lower Colorado River lands is thus estimated to be 1,420,000 acre-feet.

Yampa and White River Basins, Colo., have been the subject of an investigation made in 1916 with the special object of determining the irrigable areas that may require a water supply in the future. The report shows the irrigated area to be approximately 105,000 acres and that 270,000 acres may reasonably be expected to require water in the future.

Uinta Basin, Utah, was also investigated in 1916 and 1917 and report made; 108,000 acres were irrigated in 1915 and approximately 175,000 acres additional may be irrigated, conditional on providing 38,000 acre-feet of storage on Lake Fork and a rearrangement of diversions on Uinta River.

Grand River Basin, Colo.—A large part of the irrigable area of this basin is included in two of the projects of the Reclamation Service, the Grand Valley and the Uncompahgre Valley projects. An estimate based on the latest reports of these projects and an investigation of the Dolores River Basin by the Reclamation Service in 1916 show that 297,000 acres were irrigated in 1916 and 240,000 acres additional may be irrigated.

San Juan River Basin contributes from 1,500,000 to 3,250,000 acre-feet of water annually to the Colorado River. The territory drained is approximately 25,800 square miles in southwestern Colorado, northwestern New Mexico, and southeastern Utah. Practically all of the run-off comes from the western slope of the Continental Divide in Colorado and New Mexico, and it is along these upper tributaries that most of the present diversions are made to water the bottom valley lands. The area at present irrigated from the San Juan River and its tributaries is estimated at 107,000 acres.

The future possibilities for irrigation from the main stream of San Juan River appear to be confined to development of comparatively small tracts of bottom lands, if in fact the difficulty of maintaining diversions does not eliminate this possibility, and the additional irrigable area in the basin that may require a water supply in the future may be summarized as follows:

	Acres.
San Juan River (main stream).....	30,000
Las Animas River.....	20,000
La Plata River.....	13,000
Total from San Juan tributaries.....	63,000

Little Colorado River Basin is located in northwestern New Mexico and northeastern Arizona. The Little Colorado River carries much silt at all times and since the channel is constantly shifting diversions

are difficult and expensive to maintain. Possible storage will be limited to sites located above the junction of the Puerco River with the Little Colorado.

The irrigable area has been shown to be as much as 160,000 acres, but insufficient water supply will evidently limit further development to possibly 30,000 acres in addition to about 20,000 acres under irrigation at the present time.

Following is a summary of the irrigated and irrigable areas in the upper Colorado River Basin to Black Canyon as determined from the latest available information. Many of the larger basins have been investigated by the Reclamation Service and the information gathered has been used. Many of the smaller tributary basins which have not been investigated by the Reclamation Service are included.

Irrigated and irrigable lands in upper Colorado River Basin to Black Canyon, 1916.

From—	Area irrigated in 1916.	Additional area that may be irrigated.
	<i>Acres.</i>	<i>Acres.</i>
Green River and tributaries in Wyoming.....	333,000	1,340,000
Henrys Fork in Utah ¹	5,000	10,000
Sheep Creek ²	200	.....
Carter Creek.....	200	.....
Pot and Grouse Creeks ²	600	100
Vermillion Creek.....	200	.....
Yampa River, including Little Snake River.....	69,000	253,000
Brush Creek ²	2,000	4,000
Uinta Basin (Ashley Creek and Duchesne River).....	108,000	175,000
White River.....	38,000	17,000
Willow and Hill Creeks.....	2,000	1,000
Minnie Maud Creek ²	2,000	.....
Price River ²	15,000	50,000
San Rafael River ²	35,000	30,000
Grand River and tributaries.....	297,000	240,000
Freemont River ²	15,000	40,000
Escalante River ²	1,500	12,000
San Juan River.....	107,000	63,000
Paria River ²	2,000	10,000
Little Colorado River ²	20,000	30,000
Kanab Creek ²	2,000	1,500
Virgin River ²	20,000	48,000
Green River direct, in Utah.....	4,000	2,700
Colorado River direct ²	300	.....
Total.....	1,127,000	1,337,300

¹ More recent investigations indicate that the area given for upper Green River is in excess of that which will be irrigated.

² La Rue, W. S. Paper 395.

This table shows that about 1,125,000 acres were irrigated in the upper Colorado River Basin in 1916 and that the additional area that may be developed is estimated to be approximately 1,400,000 acres.

The following is a summary of irrigated and irrigable areas in the entire Colorado River Basin for 1916:

Summary—Irrigated and irrigable areas in Colorado River Basin, 1916.

From—	Area irrigated in 1916.	Additional area that may be irrigated.
	<i>Acres.</i>	<i>Acres.</i>
Colorado River tributaries above Black Canyon.....	1,127,000	1,337,300
Colorado River, exclusive of Gila, below Black Canyon.....	463,400	1,886,300
Gila River and tributaries.....	313,000	120,000
Total.....	1,903,400	3,333,600
Total area ultimately irrigable in Colorado River Basin.....	.....	5,237,000

Following is a tabulation showing the distribution of irrigated and irrigable areas in the Colorado River Basin by States for 1916. The States are named in order, beginning at the upper end of the basin:

Distribution of irrigated and irrigable areas, Colorado River Basin, 1916.

State.	Area irrigated in 1916.	Additional area that may be irrigated.
	<i>Acres.</i>	<i>Acres.</i>
Wyoming.....	393,000	358,000
Utah.....	209,700	336,300
Colorado.....	452,200	492,000
New Mexico.....	47,000	71,000
Arizona.....	356,225	326,940
Nevada.....	5,315	11,260
California.....	365,040	1,018,690
United States.....	1,828,480	2,614,190
Mexico.....	75,000	719,400
Total.....	1,903,480	3,333,590
Total area that may be ultimately irrigated:		
United States.....		4,442,800
Mexico.....		794,400
Total ultimate area irrigable in Colorado River Basin.....		5,237,000

WATER SUPPLY AND STORAGE REQUIRED FOR IRRIGATION.

Reference has already been made to statements in various reports showing that in fall months of the years of extremely low discharge shortages have been already experienced for irrigating the present lands under development in the lower Colorado River Basin.

The rate of increase of the irrigated area in the upper Colorado Basin in the last few years, together with the areas included under the Grand Valley and Uncompahgre projects but not irrigated, points to a rapid increase of the use of the Duchesne, Green, and Grand River waters in the near future.

In considering the storage requirements for further irrigation development the following future probabilities have been assumed:

1. The erratic run-off from the Gila River, together with the probability of more storage and irrigation development in that basin, will eliminate the Gila River as a water supply for lower Colorado River lands.

2. Probable future development in the lower tributaries of the Colorado below San Juan River make it appear that the greater part of the water supply from these streams will be utilized in their respective basins and it may be said that the discharge from these streams, at least during low water season in the Colorado River, will be negligible and therefore need not be taken into account.

3. The Green, Grand, and San Juan Rivers now furnish about 92 per cent of the run-off of Colorado River at Laguna Dam, and during the low-water period when storage is required furnish almost the entire run-off.

4. The limited irrigation possibilities in the San Juan River Basin indicate that no large volume of storage will be required in the headwaters of San Juan River for local irrigation use. At least such small reservoirs as may be built in the future for local irrigation

development will not appreciably affect the present rate of run-off from San Juan River.

5. The Green and Grand Rivers furnish the most acceptable field for future storage requirements for lower Colorado River lands, both on account of the smaller silt content of these streams and the large number of feasible storage sites.

6. The water supply for future irrigation development will have to come in great part from the Green, Grand, and San Juan Rivers.

Following is a table of the estimated run-off of San Juan, Grand, and Green Rivers from April, 1899, to March, 1916, and the total of these three rivers and the estimated discharge of the Colorado at Laguna Dam.

Total run-off, San Juan, Grand, and Green Rivers, April, 1899, to March, 1916.

April 1 to March 30—	San Juan at Bluff.	Grand at Dewey.	Green at Ouray dam site.	Total three rivers.	Colorado, Laguna Dam.
	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>
1899-1900.....	13,400,000	8,098,000	8,120,000	19,618,000	23,400,000
1900-1901.....	13,260,000	6,878,000	4,531,000	14,669,000	16,300,000
1901-2.....	11,320,000	7,462,000	4,420,000	13,202,000	15,000,000
1902-3.....	1,700,000	3,415,000	3,800,000	7,915,000	8,700,000
1903-4.....	11,000,000	6,094,000	4,465,000	11,559,000	11,042,000
1904-5.....	1,080,000	5,432,000	5,752,000	12,264,000	13,134,000
1905-6.....	3,040,000	7,260,000	4,065,000	14,365,000	14,402,000
1906-7.....	2,534,000	8,786,000	6,549,000	17,869,000	19,487,000
1907-8.....	2,133,000	7,645,000	8,148,000	17,926,000	33,002,000
1908-9.....	1,837,000	4,864,000	4,432,000	11,133,000	12,544,000
1909-10.....	3,623,000	9,017,000	7,430,000	20,070,000	28,315,000
1910-11.....	1,691,000	5,779,000	4,134,000	11,604,000	13,591,000
1911-12.....	3,811,000	7,089,000	3,724,000	14,624,000	16,932,000
1912-13.....	1,811,000	8,707,000	6,125,000	16,643,000	17,849,000
1913-14.....	1,904,000	5,370,000	5,270,000	12,544,000	13,651,000
1914-15.....	2,502,000	8,400,000	6,444,000	17,346,000	20,238,000
1915-16.....	2,890,000	5,458,000	3,940,000	12,288,000	13,998,000
Mean.....	2,267,000	6,810,000	5,373,000	14,450,000	16,564,000

¹ Estimated.

It is noted that in occasional years, such as those from 1902-3 to 1905-6 and 1913-14, the run-off at Laguna Dam as estimated and compiled is but little greater than the sum of the run-off of San Juan, Grand, and Green Rivers, appearing in the preceding column. This may be accounted for by river losses, although the actually lower run-off at Laguna Dam for the year 1903-4 than the sum of the three rivers as tabulated rather indicates the possibility of errors either in the records or the computations. It is believed, however, that the river losses in a year following one of such low run-off as that of 1902-3 will certainly be very much greater than that of a year following one of high or average run-off, because of the enormous quantities of water taken up in ground storage, the major portion of which is probably carried to the surface and evaporated and the remainder of which may be several years in getting back to the river.

It is evident, if full utilization is to be made of irrigable areas in the basins of the three main tributaries, that the irrigation requirements in these basins must be taken into account in arriving at the storage available for the lower Colorado River lands.

Following is a summary in tabular form of the estimated irrigation requirements for 1,154,000 acres additional irrigable area that may

be irrigated in the Green, Grand, and San Juan basins, together with the irrigation requirements for 2,350,000 acres of irrigable land in lower Colorado River Basin, including the 463,000 acres now under irrigation.

Total estimated future irrigation requirements, Green, Grand, San Juan, and lower Colorado River Basins.

Month.	Green Basin, 800,000 acres.	Grand Basin, 240,000 acres.	San Juan Basin, 64,000 acres.	Lower Colorado River Basin 2,350,000 acres.	Total.	
	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Acre-feet.</i>	<i>Sec.-feet.</i>
April.....	60,000	16,000	1,040,000	1,116,000	18,800	
May.....	256,000	120,000	32,000	1,040,000	1,448,000	23,500
June.....	424,000	192,000	51,000	1,350,000	2,017,000	34,000
July.....	395,000	168,000	45,000	1,350,000	1,958,000	31,800
August.....	287,000	120,000	32,000	1,250,000	1,689,000	27,500
September.....	61,000	96,000	26,000	1,150,000	1,333,000	22,400
October.....		48,000	13,000	730,000	791,000	12,800
November.....				625,000	625,000	10,500
December.....				210,000	210,000	3,400
January.....				420,000	420,000	6,800
February.....				310,000	310,000	5,500
March.....				940,000	940,000	15,200
Total.....	1,423,000	804,000	215,000	10,415,000	12,857,000	.....

The table of run-off on page 400 shows the total mean run-off of the upper three rivers to be approximately 14,450,000 acre-feet, of which it has been estimated 14,150,000 acre-feet are available for new irrigation development. This amount is a surplus of 10 per cent over the total irrigation requirement of 12,857,000 acre-feet estimated as required for new irrigation development.

The area in the entire Colorado River Basin which may be considered as requiring water supply in the immediate future may be taken as 1,100,000 acres, of which 900,000 acres are in the lower basin. Of this latter area, 463,000 acres are now under irrigation and may be considered as not requiring storage. This leaves 437,000 acres in the lower Colorado River region as the area which will begin to require storage at once as the irrigated area is extended. Taking the low year supply, 1902-3, it has been estimated that for the 1,100,000 acres requiring a supply in the immediate future the shortage would have been 644,000 acre-feet. Assuming an additional evaporation of 36,000 acre-feet, there would be required 680,000 acre-feet of storage, or a storage requirement of 1.56 acre-feet per acre for the 437,000 acres estimated increased acreage in the lower Colorado River Basin within the immediate future. There would also probably be some loss from storage in the effort to maintain the desired flow at lower river diversion points from storage in the upper basin, so that this storage requirement of 1.56 acre-feet per acre should probably be increased to 1.75 acre-feet per acre requiring nearly 800,000 acre-feet of storage capacity required in the immediate future, and this storage requirement will be largely increased as the total area irrigated in the basin increases. For example, it is estimated that for a total area of 1,350,000 acres irrigated in the lower Colorado River Basin and an increase of 525,000 acres in upper Colorado River Basin, storage to the amount of 2,600,000 acre-feet will be required.

Study of a hydrograph showing the combined flow of the Green and Grand and San Juan Rivers, for the years 1899 to 1916, inclusive, and the deficiency that would have had to be made up by storage in order to supply the total ultimate irrigable acreage of the basin during those years shows that the critical period for this term of 17 years would have been the years 1899-1903.

Following is a tabulation showing the storage capacity required for hold-over storage to supply future irrigation demands in a period such as 1899-1903. The estimated seasonal evaporation has been taken from a detail study made of the storage possibilities at Ouray Reservoir in conjunction with proposed regulating reservoirs on Grand and San Juan Rivers for the purpose of supplying the 1902-3 shortage from the high water of 1899:

Storage capacity required for hold-over storage in Colorado River Basin to supply future irrigation demands, period 1899-1903.

Irrigation season.	Shortage in supply.	Estimated seasonal evaporation.	Total storage required for irrigation season.	Surplus available for storage.	Total reservoir capacity required.	Date.
1902-1903	<i>Acre-feet.</i> 5,829,000	<i>Acre-feet.</i> 209,000	<i>Acre-feet.</i> 6,038,000	<i>Acre-feet.</i> 1,113,000	<i>Acre-feet.</i> 6,038,000 4,925,000	June 1 May 1
1901-1902	4,741,000	292,000	5,033,000	4,822,000	9,958,000 5,136,000	July 1 May 1
1900-1901	4,589,000	319,000	4,908,000	6,170,000	10,044,000 3,874,000	July 1 May 1
1899-1900	2,414,000	213,000	2,627,000	9,013,000	6,501,000	Aug. 1

The tabulation indicates that the maximum storage capacity of 10,000,000 acre-feet would have been required July 1, 1900. If, however, the shortage in the surplus over the demands for the two years, 1903-4 and 1904-5, of 1,730,000 acre-feet is also to be supplied, together with two additional seasons' reservoir evaporation, which would probably bring this figure to 2,000,000 acre-feet, then the hold-over storage required for this low period would amount to 12,000,000 acre-feet.

STORAGE SITES AND AVAILABLE WATER SUPPLY.

Storage sites on the Colorado River system exceed in capacity the proposed future demand for storage. It has been shown in a study of hold-over storage requirements for the period 1899-1905 that a total of 12,000,000 acre-feet of storage would have provided capacity enough, if properly located on Grand, Green, and San Juan Rivers, to provide full irrigation requirements for all feasible development. It was also shown that if a shortage of less than 7 per cent may be accepted for years 1903 and 1904, no hold-over storage for these years being provided, 10,000,000 acre-feet of storage would have supplied all requirements of the extreme low year 1902.

In the early part of this report, eight reservoir sites in the upper Colorado River Basin are listed, having a total capacity of 22,110,000 acre-feet. (See also map, page 390.) In addition to these, there are

many small reservoir sites on the headwaters of the main tributaries which are of too small capacity to consider seriously for any general storage plan. These small reservoirs are so situated, and in many cases can be built at such a cost, that they will probably be utilized for local irrigation development.

Three reservoir sites in the Green River Basin are so situated as to command large volumes of water, as follows:

Flaming Gorge Reservoir site, located in Wyoming, with its dam site in Utah a few miles below the State line, has a capacity of 3,500,000 acre-feet with a dam having a spillway 225 feet above river surface. The mean annual run-off of Green River at this site is approximately 2,300,000 acre-feet, varying from 1,440,000 in 1905 to 3,880,000 estimated in 1899.

Juniper Reservoir site, located on Upper Yampa River, has a capacity of 1,550,000 acre-feet with a dam raising water 200 feet above the river surface. The estimated mean annual run-off available at this site is approximately 1,200,000 acre-feet, varying from 760,000 acre-feet in 1915 to 2,150,000 acre-feet in 1917.

Ouray Reservoir site on lower Green River is located in Utah and receives the discharge of the three main tributaries of the Green River, namely, Yampa, Duchesne, and White Rivers. The capacity of this reservoir site, with a dam in upper Desolation Canyon raising the water 170 feet above the river surfaces, is 10,000,000 acre-feet. This capacity would be increased to 15,000,000 acre-feet, with a dam raising water 200 feet above river surface. The mean annual run-off through this reservoir site, estimated for period 1903-1916, inclusive, is approximately 5,400,000 acre-feet, varying from 3,534,000 acre-feet in 1915 to 8,622,000 acre-feet in 1907.

In the Grand River system, three important reservoir sites, having a combined capacity of 5,270,000 acre-feet, are worthy of consideration in a general-storage plan.

Kremmling Reservoir site, located in Colorado in Upper Grand River Basin, commands a mean annual run-off of 1,250,000 acre-feet, with a variation from 891,000 acre-feet in 1908 to 1,720,000 acre-feet in 1914. A dam raising water 230 feet above river surface would store 2,200,000 acre-feet in this reservoir site. Foundation conditions at the dam site are not as favorable as desired for a dam of masonry type, but from the investigations made it can not be said that a dam of this type is not feasible.

Bedrock Reservoir site is located on Dolores River in Colorado. A dam with spillway 210 feet above river surface would have a capacity of 800,000 acre-feet. Borings have not been made at this site, but surface indications are not favorable for a masonry dam. The mean annual run-off at this site is estimated to be 400,000 acre-feet, varying from 200,000 acre-feet in 1900 to 446,000 acre-feet in 1897.

Dewey Reservoir site is located on lower Grand River and commands practically the entire run-off of Grand River, which is estimated to be a mean of 6,820,000 acre-feet varying from about 3,800,000 acre-feet in 1902 to over 9,000,000 acre-feet in 1909.

Dolores River enters the Dewey Reservoir site about 2 miles above the proposed dam site, and there are no important tributaries below the dam site. A dam with spillway 215 feet above the river surface at this site would create a capacity of 2,270,000 acre-feet. It is estimated that if all the silt entering this reservoir were depos-

ited the entire capacity would be used up in approximately 230 years.

Bluff Reservoir site in the San Juan River Basin, has been considered in connection with general storage possibilities, but recent silt observations made at the Bluff dam site indicate a mean silt content of 1.41 per cent by weight, or a little over 1 per cent by volume for the period March 17 to July 18, 1917. It therefore appears that the Bluff Reservoir site should be given careful consideration before adoption for use as a storage reservoir on account of the comparatively short time during which it would probably serve its purpose as a storage reservoir. The mean annual run-off of San Juan River at the Bluff dam site is estimated to be 2,300,000 acre-feet, varying from 700,000 acre-feet in 1902 to 3,400,000 acre-feet in 1899. If all silt entering the reservoir were deposited, the reservoir would be silted up at the rate of about 24,000 acre-feet each year. Reservoir capacity with a dam raising the water 206 feet above river surface would be 1,350,000 acre-feet.

Relative value of storage sites.—If flood protection for the lands along the lower Colorado River were to be given no consideration, there seems no question but that the Juniper Reservoir site would give the greatest value for the investment required, and probably would furnish the required storage for the immediate future. Under these circumstances the construction of Juniper storage would be logically followed by that of the Kremmling and Flaming Gorge Reservoirs. When irrigation development had reached a point where additional storage would be required, the Bedrock Reservoir site on Dolores could be utilized. The total capacity of the four reservoirs is 8,000,000 acre-feet.

It has been shown that for ultimate irrigation development 10,000,000 acre-feet of storage will be required as a minimum. To complete the 10,000,000 acre-feet storage the Dewey site may be added, but the maximum practicable capacity of a reservoir at this site is but about 2,270,000 acre-feet and the mean annual run-off of Grand River through the site is approximately 7,000,000 acre-feet. Silt deposits will therefore begin to encroach seriously on its storage capacity in a few years, with the result that the great number of comparatively small reservoirs in the headwaters of Grand and San Juan rivers, such as the Animas, for example, would need soon to be utilized, possibly at the expense of local irrigation development.

As an alternative to these small reservoirs, partial development to a capacity of at least 2,000,000 acre-feet could be provided at the Ouray Reservoir site with an estimated surplus of 2,000,000 acre-feet for silt deposits.

As an alternative to the four larger reservoir sites mentioned above and having a capacity of 8,000,000 acre-feet, the Ouray Reservoir site may be considered. Silt deposits in Ouray Reservoir site, if no surplus capacity were allowed for silt, would be a consideration in favor of the four smaller sites. With storage plans at Ouray Reservoir site for 10,000,000 acre-feet capacity, allowing a surplus of 2,000,000 acre-feet for silt deposits, this site may be considered of somewhat more than equal value to the other storage sites mentioned so far as capacity is concerned.

Comparing the mean annual flow commanded by Ouray Reservoir as against the four other reservoirs, it is found that about 5,400,000 acre-feet of mean annual run-off are commanded by the Ouray

site, while that of the alternative four sites is approximately 5,050,000 acre-feet or a difference of 350,000 acre-feet in favor of the Ouray site.

With protection of lower Colorado River lands from the menace of floods considered, the use of Ouray storage site becomes very desirable as it would at once give practically complete control of Green River floods; which in conjunction with regulating reservoirs on the Grand, San Juan, and Gila Rivers would entirely remove the menace to the large area now irrigated and to be irrigated on lower Colorado River and in the Salton Basin. In addition it would reduce in great part the annual expenditures along the lower Colorado River itself for bank protection.

The effect of development of Flaming Gorge, Juniper, Kremmling and Bedrock Reservoir sites, as against that of the Ouray Reservoir site on power development may be briefly outlined as follows:

Under either plan of development, water held in storage will need to be released in large volumes during the low summer and fall months. In addition, large volumes of water will need to be held over in storage, from high years to years of low run-off, and it may therefore be said that power development below these reservoirs, at least so far as the junction of Green and Grand Rivers, will be seriously affected. It is therefore certain that the development of Ouray storage would interfere with power development on Green River to a much less extent than were the Flaming Gorge and Juniper Reservoir sites to be used. With Ouray storage used and Kremmling not used, future power development would not be affected on the upper Grand River unless the Dewey Reservoir site were to be used for flood control of that stream, in which case power development above that reservoir would not be affected at all and any possible power development below Dewey Reservoir would actually be benefitted thereby. In addition, the Kremmling Reservoir would be left available, either for power development or for requirements of irrigation in the Grand River Basin or possibly available for use of both interests in cooperation.

FLOOD REGULATION.

The regulation of floods on Colorado River, in conjunction with irrigation development proposed, may be effectively accomplished within a probable maximum discharge of 60,000 second-feet by providing regulating reservoirs at the Dewey site on Grand River, the Bluff site on San Juan River and the Sentinel site on Gila River, together with Ouray storage and regulating reservoir on Green River, and the construction of a regulating reservoir in Boulder Canyon. The floods from Green and Grand Rivers usually come at the same time in the year, being caused by the rapidly melting snows in the mountains in which the tributaries of these streams rise. The spring flood from the San Juan comes at about the same time though often beginning a short time before. Floods from the Gila usually come in January or February though smaller floods have occurred in the late fall months. The San Juan may flood in the fall months occasionally as it did in October, 1911, and any proposed regulation of San Juan and Gila Rivers must therefore provide for the contingency of their floods occurring at the same time.

The Green and Grand Rivers together discharged a mean of about 92,000 second-feet during the month of June, 1909, and a mean of over 96,000 second-feet during the month of June, 1917. It is these drawn out floods from the Green and Grand Rivers jointly that cause the yearly floods on lower Colorado River. Occasional floods from the San Juan and Gila Rivers may be expected to cause troublesome floods for short periods in the fall and winter months. In fact the highest discharge of record on Colorado River at Yuma was caused by a flood from Gila River alone in January, 1916.

Dewey Regulating Reservoir site on Grand River may be utilized to control the floods from that stream to maximum of 25,000 second-feet by providing 2,270,000 acre-feet storage capacity by a dam with spillway 215 feet above river surface.

With Ouray storage of 10,000,000 acre-feet capacity available on Green River, the discharge of Green and Grand Rivers could thus be regulated during the high-water periods to a discharge between 25,000 and 30,000 second-feet; whereas without regulation these rivers in some years of high run-off have discharged between 90,000 and 100,000 second-feet for a period of one month to six weeks.

Bluff regulating reservoir site on San Juan River has been made the subject of a report by McKittrick in which two systems of discharge openings are considered in their relation to storage capacity required and probable silt deposits in the reservoir. The openings considered are open conduits through the dam, 8 feet in diameter. McKittrick shows that the system of four openings proposed, while it would require nearly as great a capacity in the reservoir for the extreme flood of 1911, would empty the reservoir much quicker and thus reduce to a great extent the time in which silt deposits would occur in the reservoir.

Sentinel regulating reservoir site is located on Gila River below Gila bend. The dam site is located almost due north of the town of Sentinel on the Southern Pacific Railway. A regulating reservoir at this site would control the entire run-off of Gila River.

The plans considered allow 600,000 acre-feet of excess capacity for silt deposits. If no silt is carried through the reservoir in suspension, and the mean annual silt deposit were 7,100 acre-feet per year, it would be 85 years before the effective regulating capacity would be encroached upon.

Boulder Canyon regulating reservoir site.—Between Ouray and Dewey on the upper river and Boulder Canyon in Arizona, omitting the San Juan, no storage or regulating reservoirs are planned on any of the tributary streams. Most of these tributaries are small streams and on none of them is the normal flow of importance. The Virgin and the Little Colorado, however, draining 11,000 and 25,900 square miles, respectively, are subject to sudden and violent floods and a reservoir in Boulder Canyon below the mouth of the Virgin River is proposed as the most feasible means for the regulation of this section of the river.

PLAN OF STORAGE PROPOSED FOR IRRIGATION AND RIVER CONTROL.

The Sentinel Reservoir site on Gila River, the Bluff Reservoir site on San Juan River and the Boulder Canyon Reservoir site at the head of the lower river are proposed for regulation of those streams as outlined under previous discussions.

The Dewey regulating reservoir is proposed for Grand River regulation with its large additional value for storage for irrigation in conjunction with Ouray storage.

Ouray Reservoir with 10,000,000 acre-feet storage capacity, is proposed as the main storage reservoir. This storage in conjunction with the Dewey regulating reservoir will make possible the control of Green and Grand Rivers.

As an alternative for the Ouray Reservoir site, in case foundation conditions are not found favorable for a dam either of masonry type or earth-filled type, Flaming Gorge and Juniper Reservoir sites are proposed. Only about 63 per cent of the annual run-off of Green River is controlled by the location of the two latter sites, and therefore their inability to completely control the Green River run-off makes them of secondary importance to the Ouray Reservoir site.

CONCLUSIONS AND RECOMMENDATIONS.

From the investigations and studies made, the following conclusions are reached:

(a) That there is sufficient water supply in Colorado River, if storage is provided, to supply all future irrigation requirements within the drainage basin.

(b) That in order to fully utilize the water supply for future irrigation development, storage capacity of 10,000,000 to 12,000,000 acre-feet is required.

(c) That it is possible so to distribute this storage as to permit the fullest development feasible, not only in lower Colorado River Basin but in the upper tributary basins.

(d) That the ultimate cost of such storage for the fullest irrigation development on the lower Colorado River will be well within the value of such storage to the lands that may be supplied.

(e) That the additional area feasible to irrigate in the Upper Basin is 1,154,000 acres, making the ultimate irrigation development approximately 2,500,000 acres.

(f) That the ultimate area feasible to irrigate in the lower Colorado River Basin is 2,350,000 acres, of which about 465,000 acres are now under irrigation.

(g) That such storage for irrigation provides a large degree of flood protection and that complete flood regulation to a maximum of 60,000 second-feet may be provided by additional flood regulating reservoirs on Grand, San Juan, and Gila Rivers at a cost well within the value for such protection.

(h) If river control is to be disregarded, Kremmling or Juniper Reservoirs, depending on further detailed estimates showing comparative costs, will be best suited to the needs for storage for irrigation in the near future. The one selected should be followed by the other and those followed by the Flaming Gorge or Bedrock Reservoir sites or both, for complete storage plans.

(i) If river control is to be given first importance, Dewey regulating storage, followed by (1) Ouray Reservoir storage or (2) Flaming Gorge, Juniper and Kremmling storage, should be considered. Sentinel, Bluff, and Boulder Canyon regulating storage would be required to complete river control.

(j) That, with the exception of that portion of Green River between Desolation Canyon and the mouth of the river, the immediate

gain to future power development from the proposed regulation materially exceeds the loss, and that, considering the advantages which such regulation provides in connection with fuel-power plants, there is in the regulation proposed a material benefit to water-power development in the Colorado River Basin as a whole.

WATER POWER.

The following discussion is an abstract, with some omissions, of that part of Water Supply Paper No. 395, by E. C. La Rue, dealing with this subject.

The physical conditions in the Colorado River Basin are not in general favorable for the development of cheap water power. From Green River at Green River, Wyo., 6,070 feet above sea level, the distance by river to the Gulf of California is 1,487 miles, and the average fall is therefore 4.08 feet per mile. In this distance there are about 1,000 rapids but no sheer drops. In the valleys the fall is between 1 and 2 feet per mile; in a 10-mile section of the canyon it may be as much as 15 feet per mile. The greatest fall per mile is in Ladore, Cataract, Marble, and Grand Canyons.

At Kremmling, Colo., Grand River is 7,312 feet above sea level and at its mouth 3,880 feet, the intervening distance being 356 miles and the average fall 9.64 feet per mile, Grand River and its tributaries offer the best inducements for the development of head for power by diversion. The low fall and other unfavorable conditions on the Green and Colorado would render the diversion of these streams to develop head for power unfeasible. However, an enormous amount of power can be developed on these rivers by constructing high dams.

It is estimated that more than 2,000,000 horsepower may be developed without interfering with the use of the water for irrigation.

There are about 25 hydroelectric plants in the Colorado River Basin, many of which develop but a few hundred horsepower. In addition, there are eight or more small plants where power for milling and for pumping water for irrigation is used direct from the wheel shaft.

The following table gives a list of the hydroelectric plants at present [1916] in operation in the Colorado River Basin:

GREEN RIVER BASIN.

Name of plant.	Index No. ¹	Stream.	Operating head.	Installed capacity.	
				Kilo-watts. ²	Horse-power. ³
Ashley Creek.....	1	Ashley Creek.....	Feet. 84	250	400
Myton.....	2	Lake Fork.....	.....	150	250
Cottonwood.....	3	Cottonwood Creek.....	75	50	75

GRAND RIVER BASIN.

Spruce Creek.....	4	Spruce Creek.....	250	450	4 700
Summit County.....	5	Snake Creek.....	500	1,000	1,600
Shoshone.....	6	Grand River.....	175	10,000	18,000
Glenwood Springs.....	7	No Name Creek.....	460	248	530

¹ Figures indicate position of plant on map, page 390.

² Figures represent rated capacity of generators.

³ Figures represent rated capacity of water wheels.

⁴ Two plants.

GRAND RIVER BASIN—Continued.

Name of plant.	Index No. ¹	Stream.	Operating head.	Installed capacity.	
				Kilo-watts. ²	Horse-power. ³
			<i>Fet.</i>		
Castle Creek.....	8	Maroon Creek.....	356	400	2,900
		Castle Creek.....	340	400	
		Hunter Creek.....	876	800	
Yule Creek.....	9	Yule Creek.....	90	300	424
Crystal River.....	10	Crystal River.....	390	1,300	1,750
Osgood.....	11	do.....		65	85
Rifle.....	12	Rifle Creek.....	70	150	247
Hinsdale.....	13	Lake Fork.....	65	200	180
Hidden Treasure.....	14	Henson Creek.....	90	128	321
Oursay.....	15	Uncompahgre River.....	350	450	800
Ames.....	16	Howards Fork.....	580	3,600	6,200
		Lake Fork.....	835		
Illum.....	17	South Fork, San Miguel.....	490		

COLORADO RIVER BASIN BELOW GRAND RIVER.

Tacoma.....	18	Animas River.....	963	4,500	6,700
St. George.....	19	Cottonwood Creek.....	325	45	80
White River.....	20	North Fork of White.....	12	23	33
Roosevelt.....	21	Salt River.....	* 225	10,300	15,640
South Consolidated.....	22	do.....	29	2,000	2,800
Crosscut.....	23	Crosscut Canal.....	116	5,250	6,000
Arizona Falls.....	24	Arizona Canal.....	18	1,050	1,450
Childs.....	25	Fossil Creek.....	1,050	5,400	9,000

¹ Figures indicate position of plant on map, page 390.² Figures represent rated capacity of generators.³ Figures represent rated capacity of water wheels.⁴ Head varies from 80 feet to 225 feet.

UNDEVELOPED POWER SITES.

Green River Basin.

Flaming Gorge Reservoir power site.—The Flaming Gorge power site is at the dam site for the Flaming Gorge Reservoir, in northeastern Utah. The elevation of the low-water level of Green River at the dam site in Horseshoe Canyon is 5,825 feet. By constructing a dam to elevation 6,050 for storing to elevation 6,040 feet, the reservoir capacity would be 3,130,000 acre-feet. The storage capacity between the 6,000 and 6,040 feet contour would be 1,210,000 acre-feet, or sufficient to equalize the flow of the river at this point and insure a minimum flow of 2,700 second-feet. By constructing a 3-mile tunnel at elevation 6,000 feet an effective head of about 290 feet could be obtained. With a head of 290 feet and a flow of 2,700 second-feet, 71,000 brake horsepower¹ could be developed.

Swallow Canyon power site.—Swallow Canyon is near the upper end of Browns Park, in northeastern Utah. This canyon is about 2 miles long. At its upper end, in sec. 31, T. 2 N., R. 25 E., Salt Lake meridian, an outcrop of solid rock extending across the channel of Green River indicates that it would be practicable to construct a high dam. The water level could be raised about 150 feet without interfering with the development of the Flaming Gorge site. By utilizing the Flaming Gorge Reservoir site a uniform flow of 2,700 second-feet could be maintained, which, with a head of 150 feet, would make possible the development of 36,800 brake horsepower.

¹ In this report brake horsepower represents horsepower on the water-wheel shaft, calculated on the basis of a water-wheel efficiency of 80 per cent.

Cross Mountain Canyon power site.—The Cross Mountain Canyon site is on Yampa River, a few miles above Little Snake River in Moffat County, Colo. The canyon is about 4 miles long, and by constructing a pipe line 3 miles long a head of 165 feet could be obtained; with a pipe line and canal $7\frac{1}{2}$ miles long a head of 224 feet would be available. Twenty-eight miles above Cross Mountain is the Juniper Mountain Reservoir site, where a dam 165 feet high would give a storage capacity of 600,000 acre-feet. The average annual flow of Yampa River at Cross Mountain Canyon is about 1,100,000 acre-feet. By storing 600,000 acre-feet at the Juniper Mountain Reservoir site (see p. 390) a uniform flow of 1,100 second-feet could be maintained in this canyon. The low-water flow under normal conditions is between 50 and 100 second-feet. With a uniform flow of 1,100 second-feet and a head of 224 feet 22,400 brake horsepower could be developed.

Blue Mountain Canyon power site.—Seven miles below the mouth of Little Snake River in Moffat County, Colo., the Yampa enters Blue Mountain Canyon through which it flows to its confluence with Green River. The elevation of Yampa River at the head of this canyon is 5,583 feet; at its mouth, 5,065 feet; the total fall in the canyon is 518 feet. By constructing two or three dams it is probable that an aggregate head of 400 feet could be made available. No investigations of dam sites have been made, and these data are presented as showing possibilities only. By utilizing the Juniper Mountain Reservoir site a uniform flow of 1,100 second-feet can be maintained in this canyon, and this flow, with a total head of 400 feet, would make possible a development of 40,000 brake horsepower.

Split Mountain Canyon power site.—Split Mountain is on Green River, 20 miles above Jensen, Utah, and 2 miles below Island Park. By constructing a tunnel 9,000 feet long, with its upper portal at the lower end of Split Mountain Canyon and its lower portal in the SW. $\frac{1}{4}$ sec. 36, T. 4 S., R. 23 E., Salt Lake meridian, 9 miles of the river could be intercepted. An 80-foot head could be obtained without a diversion dam. The average annual discharge of Green River at this point for the 20-year period 1895 to 1914 was about 3,980,000 acre-feet or the equivalent of a uniform flow of 5,500 second-feet. If the Flaming Gorge and Juniper Mountain reservoirs should be built it is probable that a dependable flow of not less than 5,000 second-feet could be maintained at Split Mountain. The dependable low flow under normal conditions is about 600 second-feet. With a flow of 5,000 second-feet and a fall of 80 feet, 36,400 brake horsepower could be developed.

Minnie Maud power site.—The Minnie Maud site is in Desolation Canyon on Green River, about 1 mile below the mouth of Minnie Maud Creek. A 200-foot dam at this site would form a reservoir having a storage capacity of about 4,000,000 acre-feet. The capacity at the 120-foot level would be approximately 1,440,000 acre-feet, which would indicate that the storage capacity between the 120-foot level and the 200-foot level would be 2,560,000 acre-feet. If the Flaming Gorge and Juniper Mountain reservoirs should be constructed the flow of Green River would be practically under control to Jensen, Utah. The inflow from White and Duchesne rivers could be regulated with a storage capacity of about 2,560,000 acre-feet at the Minnie Maud storage site. It would therefore be possible to utilize the Minnie Maud storage dam to the level of 120 feet to

obtain a head for power development. The discharge records obtained at gauging stations in the Green River basin indicate that the average annual run-off available for storage at the Minnie Maud Reservoir site for the 20-year period 1895 to 1914 was 5,300,000 acre-feet, or the equivalent of a uniform flow of 7,330 second-feet. Probably a mean low flow of not less than 6,000 second-feet could be maintained by storage, as indicated above. With a head of 120 feet and a flow of 6,000 second-feet, 65,400 brake horsepower could be developed.

Rattlesnake power site—The Rattlesnake site is on Green River in Desolation Canyon, about 37 miles below the Minnie Maud dam site and about 3 miles above the mouth of Rattlesnake Creek. A dam 175 feet high could be constructed to raise the water level 165 feet, and the backwater would not extend to the Minnie Maud dam site. If the Minnie Maud power site were utilized as discussed in the preceding paragraph, a minimum flow of 6,000 second-feet would be available for power development at the Rattlesnake dam site. With a head of 165 feet and a flow of 6,000 second-feet 90,000 brake horsepower could be developed.

Coal Creek power site—The Coal Creek site is on Green River at the mouth of Coal Creek, 29 miles above the town of Green River, Utah. The Green River Co. proposes to construct a dam at this point for the purpose of diverting 2,000 second-feet of the water of Green River to irrigate land in the vicinity of Green River, Utah. Raising the water level at Coal Creek 160 feet would not interfere with the development of power at the Rattlesnake dam site. The dependable minimum flow available at Coal Creek would be the same as that available at the Minnie Maud and Rattlesnake sites, or 6,000 second-feet. Assuming that 2,000 second-feet will be diverted for irrigation, there would remain 4,000 second-feet available for use in power development. With a head of 160 feet and a flow of 4,000 second-feet 58,200 brake horsepower could be developed.

Grand River Basin.

Gore Canyon power site.—Gore Canyon is immediately below the Kremmling Reservoir site on upper Grand River, in Grand County, Colo. The canyon proper is about $3\frac{1}{2}$ miles long. In an 8-mile section of the river, beginning at the railroad station at Gore, the fall is 420 feet. The Central Colorado Power Co. has investigated the feasibility of developing power in this canyon. Owing to the precipitous character of the canyon walls the river can not be diverted except by means of a tunnel. By constructing a tunnel 24,000 feet long a head of 411 feet could be obtained. By utilizing the Kremmling Reservoir site a mean flow of 1,600 second-feet would be available and about 60,000 brake horsepower could be developed.

Colorado River and Tributaries Below Grand River.

Marble Canyon power site.—Marble Canyon extends from the mouth of Paria River, a few miles south of the Utah-Arizona line, to the mouth of Little Colorado River. The fall in this 60-mile section of the river is about 550 feet and by constructing three dams a head of 450 feet could probably be developed. Under present conditions the natural dependable low-water flow of Colorado River in Marble Canyon is about 3,500 second-feet. If the flow of the Colo-

rado should be regulated to meet the demands of irrigation the dependable low flow in the canyon would be approximately 10,000 second-feet. With a head of 450 feet 143,000 brake horsepower could be developed without storage and 410,000 brake horsepower with storage.

Upper Grand Canyon power sites.—The Grand Canyon of the Colorado is in northwestern Arizona. In the 84 miles between the mouth of the Little Colorado and Kanab Creek the fall is 780 feet, the average fall per mile being 9.3 feet. Owing to the precipitous character of the canyon walls it would not be feasible to create a head by diversion, but by constructing four dams it may prove feasible to utilize 600 feet of the fall. At many points the canyon walls are but a few hundred feet apart, and foundations suitable for high masonry dams can probably be found. The dependable minimum flow is about 3,500 second-feet. If the flow of the Colorado should be regulated for irrigation, the dependable minimum flow would be about 10,000 second-feet. Without storage 191,000 brake horsepower could be developed; with storage, 545,000 brake horsepower.

Lower Grand Canyon power sites.—In the lower Grand Canyon between Kanab Creek and the Nevada-Arizona State line, the Colorado falls about 850 feet in 144 miles, the average fall per mile being 5.9 feet. The physical conditions are similar to those in the upper section of the Grand Canyon. To create a head for the development of power it would be necessary to construct high dams. Private parties are considering plans for the development of power on this section of the river by means of six 100-foot dams, and it seems probable that a total head of 750 feet can be utilized in developing power. With the present minimum flow of 3,500 second-feet 239,000 brake horsepower could be developed; with the river flow regulated to conform to the future demands for irrigation, 10,000 second-feet would be available during the low state, and this flow, with a head of 750 feet, would make possible the development of 682,000 brake horsepower.

SUMMARY.

A summary of the possibilities of the undeveloped powers is presented in the following table:

Undeveloped power sites in Colorado River basin.

Name of site.	Index No. ¹	Stream	Estimate of available power. ²
			<i>Brake horsepower.</i>
Flaming Gorge.....	1	Green River.....	71,000
Swallow Canyon.....	2	do.....	36,800
Cross Mountain Canyon.....	3	Yampa River.....	22,400
Blue Mountain Canyon.....	4	do.....	40,000
Split Mountain Canyon.....	5	Green River.....	36,400
Minnie Maud.....	6	do.....	65,440
Rattlesnake.....	7	do.....	90,000
Coal Creek.....	8	do.....	58,200
Gore Canyon.....	9	Grand River.....	60,000
Marble Canyon.....	10	Colorado River.....	410,000
Upper Grand Canyon.....	11	do.....	545,000
Lower Grand Canyon.....	12	do.....	682,000
Total.....			2,117,200

¹ The numbers in this column correspond to the numbers on map of Colorado River drainage basin.

² On water wheel shafts realizing 80 per cent of theoretical power.

INVESTIGATIONS IN COLORADO RIVER BASIN DURING FISCAL YEAR 1919.

Boulder Canyon reservoir site.—During the fiscal year 1919 topographic survey has been made of the Boulder Canyon reservoir site in Nevada and Arizona. The Boulder Canyon reservoir contemplates the construction of a dam in Boulder Canyon and the flooding of large areas on the Colorado and Virgin Rivers. The area within the 1,250 contour is in the neighborhood of 200 square miles, most of it lying in the Virgin River Valley extending from its junction with the Colorado northward about 32 miles and having an average width of nearly 4 miles. The storage area along the Colorado River has not been fully determined, but it will have an average width of nearly 3 miles for the first 15 miles above the dam site. The topography at the Boulder Canyon dam site has not yet been taken nor has the river bed been tested for foundations.

Dewey dam site.—The Dewey dam site is located on the Grand River about 2 miles below its junction with the Dolores. The reservoir created by a dam at this point will receive practically the entire run-off of the Grand River, which has been estimated at 6,810,000 acre-feet per annum; with a spillway 200 feet above ordinary low water a capacity could be had of 2,600,000 acre-feet and the area flooded would be about 25,000 acres.

Seven holes were put down at this site, six of them being on a line at right angles to the river and one about 150 feet south of this line. The average depth of bedrock is about 40 feet below low water in the river. The average penetration of the five holes drilled in the bottom of the canyon was 20 feet and the greatest penetration 32 feet. The core saved shows a hard, fine-grained sandstone, to all appearances the same as that revealed in the abutments.

Gila River dam site.—See Sentinel project.

IDAHO.**BOISE PROJECT EXTENSION, HILLCREST UNIT.**

The area embraced within this proposed extension is covered by two irrigation districts, organized under the laws of the State of Idaho, and contains 14,000 irrigable acres lying above and to the southwest of the main south side canal of the Boise project. To reach this land it is proposed to utilize the existing hydroelectric power plant at the Boise River diversion dam for the operation of pumping plants to lift the water 80 feet to the main canal, which will have a capacity of 200 second feet, with lateral systems for the distribution to the various farm units. The only work performed on the proposed extension during the past fiscal year consisted of making surveys and accumulating data required for designing the necessary pumping plants.

MINIDOKA PROJECT EXTENSION, NORTH SIDE PUMPING UNIT.

The development of the 100,000 acres of irrigable land in this extension, lying to the north and west of the present Minidoka project, will require a storage of some 325,000 acre-feet of water at the American Falls or some other reservoir site on the Snake River and a hydro-electrical power plant at some convenient point to generate power for the operation of pumping plants to raise the necessary water for

irrigation from the Snake River near Lake Walcott, the maximum lift required being 120 feet. During the past year a large amount of work has been performed in retracing the subdivisional lines of this tract and in making topography sheets of the irrigable area. Trial canal lines have been run to ascertain the most economic method of distribution and studies have been made for power and pumping plants. At the present time there is no crop production within the proposed extension and all public lands have been withdrawn from entry. Investigations are still in progress.

American Falls.—The American Falls Reservoir site appears to be the only possibility which will make available the entire flow of the Snake River for irrigation purposes. It is proposed to regulate the flow of the Snake River so as to permit the use of some 1,100 second-feet of continuous flow from the reservoir for power development at points farther down the river and to utilize the remainder of the storage for irrigation purposes. Under this plan the reservoir capacity required would be 2,300,000 acre-feet and the new irrigation provided for would be approximately 450,000 acres. This irrigation supply can be utilized on the North Side, Minidoka, Hansen Butte, and Idaho Falls pumping projects and possibly the Big Bruneau project. Idaho Falls lands would be supplied from Jackson Lake storage and the lands below American Falls, now supplied from that source, could be furnished a water supply from the American Falls Reservoir. Three power plants have been constructed at American Falls, having a joint capacity of about 6,000 horsepower. These plants would have to be acquired by the Government or some satisfactory arrangements made with their owners before the reservoir can be constructed. The area to be flooded would be about 66,000 acres, one-half of which is within the Fort Hall Indian Reservation. A portion of the town of American Falls would be destroyed by the dam or submerged in the reservoir. Investigations of this project have been underway during the past several months. A preliminary geological examination of the site has been made and topography taken on both sides of the river in the vicinity of the falls on a scale of 400 feet to the inch, with contour intervals of 2 feet. The water supply available for storage has been studied in considerable detail and hydrographs from the years 1903 to 1917, inclusive, platted. These hydrographic studies have been extended to show the condition at Twin Falls, Shoshone, Augar Falls, upper and lower Salmon Falls. Ground water studies have also been made within the reservoir site. The possibility of developing power at Twin Falls, Shoshone Falls, and upper Salmon Falls in place of or to supplement the power at American Falls has also been studied and topographic surveys have been made of these various power sites. Conferences have been held with the officers of the Idaho Power Co., owners of the power plants at American Falls, with the view of reaching some basis for acquiring their property at the American Falls dam site.

Island Park Reservoir.—A preliminary survey has been made of the Island Park Reservoir site located on Henrys Fork of the Snake River and detailed topography of the dam site has been taken. Complete hydrographic records have been tabulated. By the construction of a dam 90 feet above the river bed 565,000 acre-feet of storage can be secured. This storage is proposed for the irrigation of the north side extension and lands along the canals diverting from the North Fork of the Snake River in case the American Falls Reservoir is not con-

structed. About 15,700 acres will be flooded, of which 5,000 acres are in private ownership, the balance, except school sections, being in the Targhee National Forest.

MOUNTAIN HOME PROJECT.

This project is located in Ada and Elmore Counties and contains a gross area of 700,000 acres, of which 420,000 acres are classed as irrigable. It is proposed to serve this area by diverting 7,000 second-feet of water from the Snake River into a canal about 215 miles in length heading at Milner Dam, the natural flow of the river to be supplemented by the construction of the American Falls Reservoir.

During the summer and fall of 1918, a preliminary survey was made of approximately 142 miles of the main canal and a reconnaissance made of the remainder of the line. The first irrigable area is reached 112 miles from the diversion point, practically the entire distance being in rock excavation. In addition to the storage and diversion works and the excavation of the canal section 3 wasteways, 7 siphons, 3 flumes, and 1 tunnel, 4,600 feet in length, will be required.

MONTANA.

MISSOULA-HUSON.

This project is located in Missoula County, Mont. The lands are all in private ownership and are now being cultivated by dry-farming methods with unsatisfactory results. A hasty examination was made by Mr. F. T. Crowe to determine the possibility of supplying this area with water for irrigation purposes. Several plans were considered, the most promising being the enlargement and extension of the present Grass Valley ditch to cover an irrigable area of 8,000 acres in Frenchtown Valley. It would also be possible to irrigate about 8,000 acres of land west and south of Frenchtown by a diversion from Nine Mile Creek if storage is provided for late water supply.

FLAT WILLOW PROJECT.

This project is located in Fergus County, Mont., and its development was undertaken several years ago by the Fergus Land & Irrigation Co., which constructed a diversion canal about 1½ miles long in 1911 to divert water from Flat Willow Creek to a proposed reservoir and did a little work on a storage dam. At the request of the land owners, the Project Manager, R. H. Fifield, examined this scheme during the summer of 1918, making a study of all previous reports and available data in reference to it. The irrigation plan contemplates the construction of storage works to conserve flood waters and about 17 miles of main canal and short laterals at frequent intervals to cover the 15,000 acres of irrigable land to be reclaimed. This system will water lands on Flat Willow bench and the bottom lands lying on the north side of Pike Creek and in Yellowwater Creek and Elk Creek flats, also the bottom lands along Flat Willow Creek. Further investigations are required to determine the amount of water available for this project and the demands upon the stream flow to provide for prior irrigation and riparian rights from Flat Willow Creek.

MONTANA RECONNOISSANCE.

A reconnoissance examination was made of the following projects in Montana: Prickley Pear Valley, an area between Toston and Townsend, and the North and South benches in the vicinity of Three Forks, Mont.

NEBRASKA.**NORTH PLATTE PROJECT—GUERNSEY RESERVOIR.**

The proposed Guernsey Reservoir is located in Platte County, Wyo., and will have a storage capacity of about 61,000 acre-feet of water, of which 50,000 acre-feet will be available for irrigation. This reservoir is to be used principally for the regulation of the North Platte River to prevent the present excess diversions from the Pathfinder Reservoir, and its construction will make possible the development of new lands and overcome the present shortages in the river at times of peak demands. Topographic surveys of the reservoir and test borings at the damsite have been made. Tentative plans of the dam and regulation works have been prepared.

NEBRASKA RECONNOISSANCE.

During the fiscal year ending June 30, 1919, field reconnoissance and studies of available data relative to the following projects in Nebraska have been made:

FARMERS DITCH AND CANAL PROJECT.

This canal is planned to divert from the south side of the Platte River, some 6 miles east of the city of North Platte for the irrigation of about 50,000 acres of gently sloping bench land. This project was undertaken in 1904 by an association of farmers, and a large portion of the earth section of the canal was excavated at that time, but was never used and has since become partially refilled by the farmers and road workers. The land lying under it has been dry farmed since its settlement. Interest in irrigation has been revived recently and there has been some pumping development which has been only partially successful. The successful development of this irrigation enterprise depends upon the further conservation of water along the North Platte River and upon drainage development above the city of North Platte.

LINCOLN AND DAWSON COUNTY PROJECT.

This project is located in Lincoln and Dawson Counties and contemplates the reclamation of some 45,000 acres by a main canal diverting from the Platte River about 2 miles east of the junction of the North and South Plattes. The canal line passes through a sand-hill country for about 32 miles, at the end of which it reaches a compact body of gently rolling farming land. There is a reservoir site available in Wild Horse Valley that may be used for supplementing the water supply. A district was organized in 1895 to construct works for the reclamation of the land it embraced, but as no market was found for its bonds, the work begun by the farmers had to be indefinitely suspended. The land under this project is now being dry farmed, but there is a strong sentiment in favor of irrigation brought about by unsatisfactory crop yields as compared with those

raised under irrigation. The successful development of this enterprise depends upon supplemental storage in Wild Horse Reservoir and the development of drainage works above North Platte city.

NEVADA.

NEWLANDS PROJECT—PYRAMID LAKE EXTENSION.

This extension contemplates the irrigation of 19,000 acres in Washoe County, Nev., by diversion of water from the main canal of the Newlands project to be siphoned across the Truckee River and the construction of necessary distributing works for the land to be irrigated, none of which is now under cultivation. Topographic surveys have been made of the irrigable area and the soil has been classified. The construction of this extension can not be undertaken until the water rights in Lake Tahoe have been adjudicated or necessary storage secured elsewhere.

CARSON VALLEY PROJECT.

This project is located in Douglas County and contemplates providing an additional supply of water for lands now irrigated under existing canals and the reclamation of large bodies of land that are now without water. Water is to be taken from both the East and West Forks of the Carson River, 50,500 acre-feet of storage to be developed by the construction of the Horseshoe Bend Reservoir on the East Fork and 6,100 acre-feet in the Alpine and Dressler Reservoirs. Two high-line canals will be constructed, leading from Horseshoe Bend Reservoir to bench lands above the present irrigated areas lying along the east side of the valley and between the East and West Forks of Carson River. The present systems of canals are to be enlarged and extended to irrigate all of the lands that can be reached by them. Construction of new lateral systems will be required for dry lands, but none will be needed for the lands now in cultivation. Drainage will be necessary.

The gross area of this project is 41,400 acres, of which 39,000 acres are classed as irrigable. About 17,400 acres are now in cultivation under privately owned ditches, many of which do not furnish a satisfactory water supply.

During the investigation of this project, five reservoir sites have been examined and diamond drill borings made of the various dam sites. A study has been made of existing water rights and available supply. The possibility of extending canal systems to cover new lands in the vicinity of Carson City and below Dayton has been considered. Should this development be undertaken, more storage than now contemplated will have to be provided.

NEW MEXICO.

MIDDLE RIO GRANDE PROJECT.

This project covers a gross area of 134,000 acres in the Rio Grande Valley between San Marcial and the mouth of White Rock Canyon. Quite extensive surveys have been made of this area by the State engineer of New Mexico, and the project has been inspected by Engineers Burkholder and Conkling of the Reclamation Service. Topog-

raphy has been taken of the entire valley floor on a scale of 1,000 feet to the inch with contours at 2 feet intervals.

The reclamation plan combines both drainage and irrigation. It is found that the ground-water table is higher nearer the river than farther back toward the bluffs, from which it is presumed that most of the water comes from the river itself, and it is proposed to intercept this seepage by constructing a drain near and parallel to the river which would also be used as an outlet for lateral drainage channels to be built within the irrigated area.

To supply water for irrigation, it is proposed to construct a diversion dam at, or near, the mouth of White Rock Canyon from which canals will be constructed near the steep bluffs on either side of the river above the lands to be irrigated. About 49,000 acres are now under irrigation, of which approximately 9,000 are suffering from lack of drainage and large areas of the uncultivated lands are now water-logged.

OREGON.

OWYHEE PROJECT.

A description of this project and previous investigations made of it may be found in the Fifteenth Annual Report on page 532. Recently Engineer C. C. Fisher has made a field inspection and a study of all previous reports relating to the Owyhee project, as a result of which he proposes the following plan of reclamation which differs somewhat from any of those that have heretofore been suggested. Storage is to be provided for 426,000 acre-feet of water at the Duncan Ferry reservoir site. A main canal will divert from the south side of the Owyhee River about 180 feet above stream bed and have an initial capacity of 1,780 second-feet, 220 feet of which are carried to generate power for pumping plants. The canal will parallel the river to opposite Mitchell Butte, where it divides into two branches known as the North and South Canals. The North Canal crosses the Owyhee River in a 12-foot concrete pipe 3,400 feet long. At the outlet of this siphon is the Mitchell Butte pumping station where 220 second-feet are dropped 184 feet into the present Owyhee Canal and 182 second-feet lifted 100 feet into a canal 33.4 miles long by which 11,777 acres of irrigable land are to be watered. From the siphon the North Canal continues to near Vail Buttes, a distance of approximately 43 miles, furnishing water to 17,000 acres of irrigable land. The South Canal passes around the peninsula between the Owyhee and Snake Rivers, thence up the Snake River to near the upper pumping station of the Gem irrigation district, a total distance of approximately 56 miles. At station 20 is the Owyhee pumping station where a lift is made of 100 feet to cover 900 acres, the water used for power being dropped into a lateral and used for irrigation. At station 635 is the Alkali Creek pumping station where 252 feet of water are dropped 100 feet into the Tail race lateral and 75 second-feet lifted 100 feet to cover 4,930 acres. If the Alkali pumping canal is extended across Succor Creek, practically all of the Succor irrigation district would come under the Owyhee project and 1,030 acres would be irrigated east of Succor Creek. Water is turned down Jump Creek to be picked up by the three principal canals of the Gem irrigation district. The South Canal is considerably above the upper canal of the Gem district and covers 6,910 irrigable acres above it east of Succor Creek. The plan outlined permits the use of the present canals of the Gem

district without reversing their direction, and by feeding them at several points their enlargement would not be required in order to furnish a larger supply of water than that for which they are designed.

The system as proposed would furnish water to a total irrigable area of 78,330 acres, 17,600 acres of which must be reached by pumping plants.

LOWER POWDER RIVER PROJECT.

This project is located near Baker City, Oreg., and was first investigated by the Reclamation Service in 1908. The project at that time included 27,000 acres to be developed from the surplus water of the Powder River. Later this area was included within the Carey Act project undertaken by the Powder Land & Irrigation Co. which proposed to reclaim 65,000 acres. Their plans include storage of the surplus water of the Powder River in Thief Valley Reservoir and turning West Eagle Creek in to Balm Creek Reservoir, the Powder River water being used for the irrigation of 40,000 acres and West Eagle water for about 25,000 acres of land. Quite extensive surveys and plans were made by the Powder Land & Irrigation Co. and rights of way were purchased. The contract of the company with the State of Oregon has been extended from time to time and is still in force. A field examination and a study of all the maps and other data accumulated have recently been made by Consulting Engineer A. J. Wiley. It was found that some additional data were required in order to make a complete report upon this project and the information desired is now being gathered by engineers of the Reclamation Service.

KLAMATH PROJECT EXTENSIONS.

During the past year investigations have been made with the view of supplying water to the following extensions of the Klamath project:

TULE LAKE LANDS.

Tule Lake is a shallow body of water with no visible outlet, lying south of the southeast portion of the Klamath project. The flooded area is being rapidly reduced by evaporation and the prevention of inflow. By this means large areas have already been uncovered and a portion of the old lake bed was opened to settlement in 1917. Ultimately it is expected to reclaim 17,000 acres by this extension. At the present time only a part of the run-off tributary to the lake is under control by the Clear Lake Reservoir and a diversion canal from Lost River. Upon construction of the Horsefly Reservoir on Miller Creek, with a storage capacity of 75,000 acre-feet of water, the uncovering of the Tule Lake lands will be facilitated and an irrigation supply for additional acreage will be secured. With this additional supply it would also be possible to furnish 5,700 acres of bench land south of Tule Lake with water from the Clear Lake Reservoir already constructed, which otherwise can not be irrigated, and to reclaim 4,100 acres from the bed of Tule Lake in the southeast corner that could not otherwise be reached except by pumping. For the irrigation of the uncovered lands of Tule Lake it is proposed to provide storage in upper Klamath Lake, to enlarge and extend some of the present irrigation works of the project, and to construct two new canals diverting from Lost River.

LANGELL VALLEY UNIT.

This unit comprises 17,400 acres of irrigable land along the Lost River which it is proposed to supply with water from Horsefly Reservoir, two main canals being diverted from Miller Creek, 6 miles below the reservoir. The North Canal will be about 15 miles long and will serve all of the lands north of Miller Creek east of Lost River. From this canal a supply of water is carried across Lost River to irrigate lands west of that stream. The South Canal will run up the valley for about 12 miles and supply lands south of Miller Creek and east of Lost River. All of the lands within this unit are in private ownership, and about 15,000 acres have been cultivated under dry-farming methods.

PUMPING UNITS.

There are adjoining the present Klamath project some 23,000 acres of irrigable land that can only be reached by means of pumping plants. These high points are widely scattered and comprise 14 units, varying in size from 200 acres up to 6,000 acres; the proposed lifts range from 15 to 70 feet. Of the total area, about 16,000 acres are cropped under dry-farming methods and possibly 200 acres are irrigated from wells. The return from dry-land farming has been very meager. Storage is to be provided in upper Klamath Lake, and it is proposed to enlarge some of the present project canals and provide pumping plants to raise the water to the distributing ditches serving the high lands.

UMATILLA PROJECT EXTENSIONS.

By additional storage on the Umatilla River or its tributaries it is possible to supply with water about 35,000 or 40,000 acres of excellent land southwest of the present Umatilla project. At the present time there are about 13,000 acres of land irrigated under private irrigation systems, none of which receives a full irrigation supply. Numerous petitions have been presented to the department for the Government to provide relief for the settlers by constructing adequate storage facilities, and investigations have been made to determine the feasibility of providing additional water for the lands already cultivated and of increasing the irrigable area by the extension and enlargement of the present canal systems. Five reservoir sites have been located on McKay Creek. Apparently the most favorable of these sites is located 5 miles above its confluence with the Umatilla River. With a dam 140 feet high and a crest length of 2,400 feet about 1,180 acres of land, 780 acres of which are now cropped, would be submerged. The capacity of the reservoir with a dam of this height would be between 60,000 and 70,000 acre-feet, which might be increased without adding to the unit cost for storage. Detailed topography has been taken of the dam site on a scale of 200 feet to the inch with contour intervals of 5 feet. An additional gaging station has been established on McKay Creek and the water supply available is under investigation. Test pits and drill borings have been made at the dam site and the proximity of satisfactory building material is being investigated. Office study has been made of proposed distributing systems. Investigations are still in progress.

SOUTH DAKOTA.**ANGOSTURA PROJECT.**

An account of the Angostura project will be found in the Seventeenth Annual Report, on page 385. A board of review, composed of Mr. D. C. Henny, consulting engineer for the Reclamation Service, and Dr. Homer M. Derr, State engineer of South Dakota, after an inspection of this project and a study of the report of the surveys made in 1917 and 1918 agreed generally with the conclusions reached in the report referred to, but were of the opinion that the capacity of the reservoir might have to be increased to furnish an adequate water supply in years of low discharge; that the acre cost given in the report should be regarded as a minimum; that a further study and investigation is almost certain to result in higher estimates; and concluded:

That until values of agricultural land throughout the United States shall have greatly advanced, the Angostura project is not financially feasible.

BELLE FOURCHE PROJECT EXTENSION—CHICKEN CREEK RESERVOIR.

Under the Intake Canal and Johnston lateral of the Belle Fourche project, there are now approximately 4,000 acres of land that are not supplied with storage, depending entirely upon the natural flow of the Belle Fourche River for a water supply. Since the project was opened in 1908, there have been three years in which a lack of sufficient water has caused a shortage of crops under these canals. To overcome this difficulty, studies have been made of the feasibility of diverting flood waters from Spearfish Creek into a reservoir to be constructed on a tributary of Chicken Creek, from which the stored waters are to be diverted as needed into the Redwater River which empties into the Belle Fourche above the diversion works of the Belle Fourche project. The plan under consideration contemplates cooperation with the Redwater Canal Association, which controls the Chicken Creek Reservoir site and irrigates 4,800 acres of land south of the Belle Fourche River by means of a canal diverting from Redwater River. In the examinations so far made it appears that a sufficient water supply may be secured from Spearfish Creek and that the feasibility of building this reservoir will depend upon the construction of a safe dam at a reasonable cost and the ability to reach satisfactory agreements with the owners of the Redwater Canal and the Belle Fourche Water Users' Association as to the distribution of the water impounded and the return of the cost of construction.

TEXAS.**LOWER RIO GRANDE PROJECT.**

This project covers a large territory along the Rio Grande in the United States extending from a point near Sam Fordyce to the Gulf of Mexico and as far north as Raymondville, Tex. About 170,000 acres of this area are now irrigated by various pumping plants installed by companies holding large tracts of land. Much of the land now under ditches is without a sufficient water supply

and storage is required to meet their present demands and for the development of additional areas. The land owners in the lower Rio Grande Valley have organized the Rio Grande Conservation Association which, in 1918, applied to the Government for assistance. In response to this petition a preliminary examination of this project was made by Consulting Engineer Henny, who recommended that the Government cooperate with the Rio Grande Conservation Association in further investigations. A contract was therefore entered into between the Secretary of the Interior and the association on February 25, 1919, to investigate the feasibility of irrigating large bodies of land in Starr, Hidalgo, and Cameron Counties, Tex. On February 1, after it became certain that the cooperative examination of this project would be made, Mr. Victor E. Lieb was assigned to take charge of the field investigations. The first work undertaken was an examination of the Rio Grande below Presidio to discover possible reservoir sites. Three excellent dam sites were found known as the Mulato, Mariscal, and Boquillas, the most favorable of the three being the Mariscal which, with a reasonable height of dam, would develop ample storage for the water available. This is now estimated at 1,500,000 acre-feet per annum, practically all of which comes from the Rio Conchos, a large tributary of the Rio Grande from the Mexican side. It is understood that there are large bodies of excellent land in Mexico that can be irrigated from the Rio Conchos and that excellent storage sites exist in the mountains above these lands. If extensive development should take place in Mexico, the supply for the Lower Rio Grande project would be materially decreased. In any event, storage on the Rio Grande cannot be undertaken without some kind of an international agreement. From private surveys made heretofore it is learned that a reservoir site on Devils River about 20 miles above its mouth would store 750,000 acre-feet of water with a 200-foot dam, the run-off of the stream being estimated at 585,000 acre-feet per annum. There is also a dam site on the Pecos River located about 17 miles above its mouth where it is estimated that 275,000 acre-feet could be stored by a dam 200 feet high. The amount of run-off of this stream is 450,000 acre-feet per annum. As the water from both of these streams is now used for the irrigation of lands supplied by the pumping plants on the Rio Grande in the vicinity of Laredo and Del Rio, only a part of the run-off could be stored during the irrigation season. Further investigations of the storage possibilities on these streams are contemplated. All of these sites are located from 250 to 400 miles above the proposed diversion for a gravity canal and careful reconnaissance was made of the river between Laredo and Rio Grande city to discover a site for a regulating reservoir. The only one found was at Dolores which required a long feed canal from the Rio Grande and would have small storage capacity. No detailed surveys or investigation of the foundations have been made at any of the dam sites. Trial lines have been run to determine the feasibility of furnishing water by gravity to lands now supplied by the various pumping plants. One of these lines diverts from the Rio Grande a short distance below Rio Grande city and the mouth of the Rio San Juan. From this survey it appears that it will be possible to reach all of the lands under the pumping

plants except those under second and third lifts which supply comparatively small areas. The second line diverts from the river above San Marcial and runs in a northeasterly direction to reach the lands in the vicinity of Raymondville and Lyford.

In addition to the field surveys, a topographic map of the project has been made, using all of the available maps of this section, after having reduced them to a common datum. Hydrographic studies have been made of all the available discharge records of the various streams that will affect the construction of this project. A preliminary report of the work accomplished to the end of the fiscal year 1919 is in course of preparation.

RIO GRANDE PROJECT—TORNILLA—FORT HANCOCK EXTENSION.

South and east of the present Rio Grande project is a narrow strip of land bordering the river in the vicinity of Tornilla and Fort Hancock, embracing about 30,000 irrigable acres for the reclamation of which it is proposed to use water stored in the Elephant Butte Reservoir and to construct a canal along the north and northwestern boundary of the tract, diverting from the river near Fabens, Tex. Topographic surveys have been made of the area to be reclaimed and an irrigation district has been formed by the owners of 4,600 acres of land in the vicinity of Tornilla with a view of contracting with the Government for the construction of an irrigation system.

TEXAS RECONNOISSANCE.

In December, 1918, Asst. Engineer W. R. Parkhill made a reconnaissance examination of the Mulato Reservoir site on the Rio Grande located about 40 miles below Presidio, Tex., and of the Devils River Reservoir site located in Val Verde County, Tex., about 20 miles above its confluence with the Rio Grande. He also examined the Cotulla irrigation project located in La Salle and Denton Counties, Tex., which would require storage in the Nueces River 7 miles above Cotulla and the construction of a canal about 25 miles long for the irrigation of between 80,000 and 100,000 acres of land.

DEVILS RIVER PROJECT.

The project provides for a storage dam across Devils River just below Rough Canyon some 10 miles above the mouth of the river for the impounding of 750,000 acre-feet of water with a diversion direct from the reservoir and at an elevation of 100 feet above the river level, into a canal following down the canyon 5 or 6 miles; thence turning eastward for about 30 miles to irrigate from 90,000 to 100,000 acres of land lying between Del Rio and Brownsville.

UTAH.

CASTLE PEAK PROJECT.

A brief description of this project will be found in the Seventeenth Annual Report on page 386. During the last fiscal year a preliminary survey has been made of the main canal line diverting from the Duchesne River near the town of Duchesne. Twelve miles of this

line are on very steep sidehills in earth, gravel, bowlders, and shale and a little over 1 mile of inverted siphons under heads of 120 feet are required. At the end of 15 miles, the first irrigable land on Myton Bench is reached.

Beyond Myton Bench the line runs for 4 miles across the "bad lands" and along broken country to the head of the main body of land to be irrigated. Between 1 and 2 miles of tunnel and approximately 3 miles of flume will be required in the construction of this canal. All unentered lands within this project have been withdrawn under the second form of withdrawal. Water records have been obtained throughout the year. Further investigation of this project is contemplated.

UTAH RECONNOISSANCE.

The project manager at Provo has made brief reconnoissance examinations of the Hatchtown and Alberta projects and the possibility of irrigating land in Escalante Valley.

WASHINGTON.

YAKIMA PROJECT EXTENSIONS.

In August, 1918, investigations were begun of proposed extensions to the Yakima project and to determine the most feasible and economical development for the utilization of the available water supply in the Yakima watershed and the necessary storage to accomplish this purpose. It has been estimated that from 200,000 to 225,000 acres of new land may be reclaimed. The principal units receiving attention during the past year are as follows: Kittitas unit in Kittitas County, covering 70,000 acres of land. Moxee unit, covering 40,000 acres in Yakima County above the present canals of the Wenas, East Selah, and Moxee Valleys. A contour survey has been made of this unit and the first 15 miles of the main canal have been located. Roza unit covers 60,000 acres in Yakima and Benton Counties above the Sunnyside Canal. Topography was taken of this area. Kennewick unit covers 35,000 acres in Benton County, south of Yakima River in the vicinity of Kennewick and Kiona. Topography has been taken of about one-half of this unit. Investigation of the extensions to the Yakima project are still in progress.

WYOMING.

WYOMING COOPERATIVE WORK.

Reference is made in the Seventeenth Annual Report on page 387 to cooperative investigations of the water supply available from the North Platte and South Platte Rivers. These investigations were completed during the past year and covered an exhaustive examination of the water supply and possible irrigation development in the Platte River Valley. As under the terms of contract between the Secretary of the Interior and the State of Wyoming this report is to be reviewed by a board of engineers and their findings and conclusions published by the Reclamation Service, no extended review of the investigations so far made is submitted.

OREGON BASIN PROJECT.

The Oregon Basin project is located in Park and Big Horn Counties, Wyo., and includes an irrigable area of approximately 90,000 acres, all included in a Carey Act withdrawal of 193,000 acres made by the State of Wyoming in 1904 and extended in 1914 for a period of five years. As this extension has lapsed, the lands have been withdrawn under the terms of the reclamation law.

The Big Horn Basin Development Co. contracted with the State for the construction of the necessary irrigation works to supply water to the Carey Act lands, but after doing a considerable amount of construction, no part of which was so built that water could be delivered to any part of the lands, the company failed. During the summer of 1918 quite extensive surveys were carried on by the Reclamation Service in connection with this project. The plans that have been considered contemplate the diversion of water from the Shoshone Reservoir into a reservoir to be constructed in Oregon Basin, from which it will be diverted into a main distributing canal for the irrigation of lands in Oregon Coulee and along Dry Creek with a possible extension from Dry Creek to cover additional areas. A number of alternative lines have been considered and data have been secured upon which to base the development of a complete irrigation plan and to determine the lands which can be most advantageously and economically reclaimed.

GREEN RIVER BASIN PROJECTS.

An account of the investigation of the Green River Basin by the Reclamation Service in cooperation with the State of Wyoming in 1915 can be found on page 543 of the Fifteenth Annual Report. As a result of that cooperative investigation it was recommended that preliminary examination be made of the Bonneville, Seedska-dee (Anderson Island diversion), Seedska-dee (La Barge diversion), Big Piney-La Barge, Opal, and Church Buttes projects, aggregating a gross area of 1,025,000 acres, in order to determine the net irrigable area, the available water supply, and the probable cost of each of these projects. In the summer and fall of 1918 field examinations, soil surveys, and studies of all available water records were made in compliance with this recommendation, the results of which may be briefly outlined as follows:

CHURCH BUTTES PROJECT.

This project covers a gross area of 70,000 acres in Uinta, Sweetwater, and Lincoln Counties, of which 25,000 acres are classed as irrigable. Its elevation ranges from 6,150 to 6,400 feet above sea level and it has an average growing season of 85 days. The water supply is to be secured from Blacks and Henrys Forks of the Green River, with storage in the proposed basin reservoir in Utah. A study of the records of stream flow indicates that although there will be 25,000 acres of irrigable land within the project, the water supply would not be sufficient for more than 7,000 acres.

OPAL PROJECT.

This project covers a gross area of 70,000 acres, of which 30,000 are classed as irrigable, and is located in Lincoln and Sweetwater Counties, Wyo. The elevation of the irrigable area ranges from 6,300 to 6,650 feet above sea level. The average growing season is 85 days. The water supply is to be secured from Henrys Fork of the Green River, with storage to be provided by the construction of the Hams Fork Reservoir, located on Hams Fork and Willow Creek a few miles above the town of Kemmerer. A railroad runs through this site along Willow Creek to Queally. Practically all of the land within the site is in private ownership, some 1,500 acres being irrigated and cropped. It is estimated that 87,800 acre-feet of storage would be required for this project and that the total amount available is 88,200 acre-feet. About 8,000 acres are now irrigated along Hams Fork, the principal crops being native hay and some alfalfa. In addition to the storage reservoir, the principal construction feature is a main canal carrying 575 second-feet of water, diverting from Hams Fork some 16 miles below the reservoir site, from which distributing systems lead to the irrigable lands.

SMALL SEEDSKADEE PROJECT (ANDERSON ISLAND DIVERSION).

This project covers a gross area of 50,000 acres, of which 28,000 acres are irrigable, and is located in Sweetwater County. Its elevation ranges from 6,200 to 6,500 feet and it has an average growing season of 85 days. Water is to be diverted from the west side of Green River near Anderson Island into a canal carrying 540 second-feet and extending in a general southeasterly direction along the upper edge of the lands to be reclaimed. No storage is required for this project. Transportation is by wagon roads to Opal and Granger about 25 miles from the center of the project.

LARGE SEEDSKADEE (LA BARGE DIVERSION).

Large Seedskadee project includes a gross area of about 190,000 acres of which 65,000 acres are believed to be irrigable. To reach this area, a canal from 30 to 40 miles in length, diverting from the Green River about 2 miles above the mouth of La Barge Creek, will be required. Omitting the narrow strip between the canal line and the river the project is about 40 miles long and 10 miles wide, the irrigable area lying in scattered patches. In case this project is constructed it will no doubt include the Small Seedskadee and by extending the main canal it could be made to cover the southeast portion of the Opal project. The elevation of the irrigable areas range from 6,100 to 6,400 feet above sea level and the growing season is from 80 to 85 days. From this project wagon hauls of from 10 to 30 miles will be required to the nearest stations on the Union Pacific and Oregon Short Line railways. Disregarding other new development, the flow of the Green River, in excess of the amount required to supply existing rights, is available for this project and there is sufficient water for its irrigation except during the month of August in years of minimum flow when storage of about 21,000 acre-feet would be needed. This shortage could be supplied by the construction of a reservoir in the Upper Green River Basin.

BIG PINEY—LA BARGE PROJECT.

This project embraces a narrow strip of land west of Green River in Lincoln County, Wyo., and extending from Big Piney where it is about one-half mile wide to a point some 3 miles south of La Barge postoffice, where it is about 3 miles wide. From the center of the project the nearest shipping points are Kemmerer and Opal on the Oregon Short Line about 50 miles distant and Rock Springs on the Union Pacific about 90 miles away. The gross area covered is 14,000 acres, of which about 9,000 acres are irrigable; 3,000 acres are now in crops, leaving about 6,000 acres for which irrigation works will have to be provided. The elevation of the project ranges from 6,550 to 6,750 feet above sea level and it has a growing season of from 65 to 70 days. Diversion would be from the north channel of the Green River into a canal of 90 second-feet capacity which practically parallels the main river throughout its entire length.

BONNEVILLE PROJECT.

This project extends from the Green River on the west to Big Sandy Creek on the east and is about 30 miles wide and 40 miles long. For its development, water must be obtained from the Green and New Fork rivers by means of a supply canal aggregating about 90 miles in length and storage to be provided in Green, Fremont, Half Moon, and Boulder lakes. By means of a 15-mile canal, 1,200 second-feet of water are to be turned from Upper Green River above Kendall into Marsh Creek, a tributary of the New Fork River, from which the water is again diverted into an intercepting canal that in its course will collect waters from Willow, Piney, Pole, Boulder, and other creeks crossed, finally tailing into Big Sandy Creek. The gross area of this project is approximately 720,000 acres, of which it is estimated that 300,000 acres are too steep and broken for irrigation, 100,000 acres are on isolated ridges that can be reached only by long and expensive pipe lines, 50,000 acres are alkali flats requiring artificial drainage, and 70,000 acres are of shallow soil which leaves about 200,000 acres of agricultural land.

A study of the available water supply indicates a requirement of 350,000 acre-feet of storage. The irrigable area ranges in elevation from 6,400 to 7,200 feet above sea level. The nearest shipping points are at Rock Springs, Green River City, and Granger on the Union Pacific Railroad and Opal on the Oregon Short Line. Practically everything except livestock is shipped from Rock Springs. The average wagon haul from this project would be between 50 and 60 miles.

Owing to the elevation of all the Green River Basin projects and the shortness of the growing season, the only merchantable crops are hay, some small grain, and the hardy vegetables, practically all of which, except those raised on the Church Buttes and Opal projects, will have to be consumed locally on account of their distance from railroad facilities. The native hay and other forage crops produced in the basin are used in the winter feeding of stock run on the range during the summer months. Farming operations in this territory have so far been profitable only when carried on in connection with the live-stock business.

DRAINAGE INVESTIGATIONS OUTSIDE GOVERNMENT IRRIGATION PROJECTS.

The sundry civil appropriation bill for the fiscal year 1919 provided \$100,000 for " * * * an investigation to be made by the Director of the Reclamation Service of the reclamation by drainage of land outside existing reclamation projects and of the reclamation and preparation for cultivation of cut-over timber lands in any of the States of the United States." A small portion of this appropriation was allotted for investigation of drainage projects outside of existing Government projects in the 17 reclamation States, excepting the eastern part of North Dakota, South Dakota, and Texas.

The drainage possibilities in the arid States, outside existing reclamation projects, that have been examined under the provisions of this act of Congress, are tabulated as follows:

Table of seeped areas outside Government irrigation projects examined during fiscal year 1919.

State.	Location.		Acres requiring drainage.
	Counties.	Districts.	
California.....	Kern.....	Bakersfield.....	60,900
	Merced and Stanislaus.....	South San Joaquin, Modesto and Turlock.....	100,000
	Merced.....	Merced.....	30,000
	Fresno, King, and Tulare.....	Fresno-Hanford.....	200,000
	Los Angeles.....	Southeast of Los Angeles.....	29,500
Colorado.....	Mesa.....	Grand Valley.....	30,000
	Saguache, Conejos, Costilla, Rio Grande, and Alamosa.....	San Luis Valley.....	850,000
	Crowley, Otero, Bent, and Powers.....	Arkansas Valley.....	100,000
	Ada and Canyon.....	Ada County No. 1.....	10,000
Idaho.....	Ada and Canyon.....	Ada County No. 2.....	30,000
	Boundary.....	Kootenai Bottoms.....	80,000
Montana.....	Stillwater and Yellowstone.....	Park City and Laurel.....	14,000
Nebraska-Wyoming.....	Scotts Bluff, Morrill, Garden, Deuel, Keith, and Lindsay in Nebraska and Goshen, Wyoming.....	North Platte Valley.....	173,000
	Washoe.....	Truckee Meadows.....	15,500
Nevada.....	Sandoval, Bernalillo, Valencia, and Socorro.....	Middle Rio Grande.....	100,000
New Mexico.....	Utah.....	Utah Lake.....	30,000
	Emery.....	Castle Valley.....	25,000
Wyoming.....	Big Horn and Washakie.....	Big Horn.....	20,000
	Big Horn and Washakie.....	Worldand.....	18,000
	Park and Big Horn.....	Lovell and Globe.....	19,000
	Big Horn.....	Big Forks.....	22,000
	do.....	Burlington-Germania.....	16,900
	do.....	Byron and Cowley.....	3,000
	do.....	Otto.....	10,000

FINANCIAL STATEMENT.

Consolidated balance sheet, all secondary projects, June 30, 1919.

Cash in special deposit account.....	\$544.55
Inventory of stock on hand.....	4,313.45
Accounts receivable.....	3,359.82
Gross cost of investigations.....	\$1,229,847.15
Less revenues earned.....	25,671.92
Net cost.....	1,204,175.23
Accounts payable.....	4,070.22
Guarantees and special deposits.....	580.25
Collections and contracts of specific amounts for repayments to reclamation fund.....	57,490.12
Capital investment: Disbursements and transfer vouchers received.....	\$1,382,125.54
Less collections and transfer vouchers issued.....	211,853.08
Net investment.....	1,160,272.46

Condensed balance sheet, Washington office, June 30, 1919.

Cash in special deposit.....	\$23.55
Inventory of materials and supplies.....	39,175.66
Accounts receivable.....	7,597.61
Contingent items.....	5,376.70
Gross cost.....	\$2,781,920.39
Less distributed to projects.....	2,761,125.37
Net cost undistributed.....	20,795.02
Accounts payable.....	8,340.52
Contingent obligations.....	5,400.25
Capital investment:	
Disbursements and transfer vouchers received.....	4,157,187.17
Collections and transfer vouchers issued.....	4,097,959.40
Net investment.....	59,227.77

Estimated cost of Washington office during fiscal year 1920.

Salaries and wages.....	\$185,000.00
Books, stationery, printing, etc.....	50,000.00
Furniture and fixtures.....	2,000.00
Telephone and telegraph service.....	2,000.00
Traveling expenses.....	15,000.00
Photo work, blue printing, and drafting supplies.....	5,000.00
Engineering and survey instruments and supplies.....	2,500.00
Books, technical and legal.....	1,500.00
Miscellaneous.....	2,000.00
Total.....	265,000.00

Condensed balance sheet, Denver office, June 30, 1919.

Inventory of materials and supplies on hand.....	\$14,099.82
Accounts receivable.....	2,754.33
Undistributed cost to date.....	24,892.00
Accounts payable.....	7,399.68
Capital investment:	
Disbursements and transfer vouchers received.....	\$335,794.62
Collections and transfer vouchers issued.....	801,448.15
Net investment.....	4,346.47

Estimated cost of Denver office during fiscal year 1920.

Salaries and wages.....	\$124,000.00
Books, stationery, printing, and office supplies.....	3,000.00
Furniture and fixtures, office.....	1,000.00
Rental of offices.....	6,000.00
Telephone service.....	1,000.00
Telegraph service.....	1,000.00
Traveling expense.....	12,000.00
Inspection, outside laboratories.....	11,000.00
Miscellaneous items.....	1,000.00
Total.....	180,000.00

Summary of general data for Garden City project to end of fiscal year 1919.

Finances:	
Net construction cost to end of fiscal year.....	\$381,423.49
Per cent completed at end of fiscal year.....	100
Gross construction cost to end of fiscal year.....	\$391,604.20

Condensed balance sheet, Garden City project, June 30, 1919.

Accounts receivable.....	\$10,351.22
Gross construction cost.....	\$391,604.20
Less revenue earnings.....	10,180.71
Net construction cost.....	381,423.49
Collections and contracts of specific amounts for repayments to reclamation fund.....	48,364.67
Capital investment:	
Disbursements and transfer vouchers received.....	\$402,424.80
Collections and transfer vouchers issued.....	59,014.76
Net investment.....	343,410.04

430 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Feature costs, Garden City project, to June 30, 1919.

Features.	Total to June 30, 1919.
Examination and suveys.....	\$7,618.72
Pumping for irrigation:	
Well pits and shafts.....	49,777.65
Pumping plants.....	51,664.13
	101,471.78
Canal system:	
Temporary structures.....	2,497.42
Concrete conduit.....	56,473.73
Bridge across conduit.....	150.30
Concrete culvert.....	97.76
Arkansas River siphon.....	26,785.15
Right-of-way fence.....	2,541.81
	88,546.17
Power system:	
Power-house building and plant.....	81,666.37
Electrical installation.....	15,410.75
Soft-water well No. 1.....	1,219.37
Coal scales, trestle, and coal bins.....	5,445.08
Industrial and railroad track.....	1,556.30
Circulating 12-foot well.....	13,800.00
Soft-water well No. 2.....	1,073.71
Soft-water well No. 3.....	1,543.73
Cooling tower.....	1,714.24
Board of survey expense.....	474.14
	123,963.69
Farm units.....	285.66
Permanent improvements and lands:	
Real estate.....	1,895.66
Headquarters buildings.....	4,866.87
Lubricating-oil house.....	374.85
Workshop.....	410.74
	7,548.12
Operation and maintenance during construction.....	48,399.14
Care of plant during nonuse.....	4,469.06
Court judgment, Camden Iron Works.....	9,271.86
Gross construction cost.....	391,604.20
Less revenues earned during construction period:	
Rentals of buildings.....	1,009.58
Contractor's freight refunds.....	1,911.73
Forfeitures by defaulting bidders.....	5,800.00
Miscellaneous revenues.....	13.00
Profit on mess-house operations.....	860.82
Profit on hospital operations.....	585.58
	10,180.71
Net cost of construction to June 30, 1919.....	381,423.49

Summary of general data for Hondo project to end of fiscal year 1919.

Finances:	
Net construction cost to June 30, 1919.....	\$371,867.31
Per cent completed on June 30, 1919.....	100
Repayments:	
Water rental charges—	
Accrued to June 30, 1919.....	9,165.06
Collected to June 30, 1919.....	9,057.50
Uncollected on June 30, 1919.....	127.55

Condensed balance sheet, Hondo project, June 30, 1919.

Accounts receivable.....		\$127.55
Gross construction cost.....	\$381,573.39	
Less construction revenue earnings.....	9,706.08	
Net construction cost.....		<u>371,867.31</u>
Capital investment:		
Disbursements, transfer, and joint construction vouchers received.....	407,745.12	
Collection, transfer, and joint construction vouchers issued.....	35,750.26	
Net investment.....		<u>371,994.86</u>

Feature costs, Hondo project, to June 30, 1919.

Feature.	Fiscal year 1919.	Total to June 1919.
Examination and surveys: Hondo Canal (Diamond A).....		\$4,422.70
Storage works:		
Storage reservoir and embankments.....		96,246.60
Outlet excavation and embankments.....		57,772.59
Protection embankment and outlet canal.....		825.48
		<u>154,844.67</u>
Canal system (diversion system):		
Headworks and earthwork inlet.....		58,362.38
Rock excavation for diversion.....		35,536.31
		<u>93,898.69</u>
Lateral system: Laterals and sublaterals.....		38,979.34
Farm units: Farm-unit subdivision.....		19,837.41
Permanent improvements:		
Real estate (reservoir, site, etc.).....		21,599.46
Buildings.....		1,738.99
		<u>23,338.45</u>
Telephone system.....		4,170.42
Operation and maintenance during construction (water rental basis).....		42,081.71
Gross construction cost to June 30, 1919.....		<u>381,573.39</u>
Less revenues earned during construction period:		
Rental of buildings.....		286.00
Rental of irrigation water.....	\$1.39	9,165.05
Contractor's freight refunds.....		159.63
Other revenues unclassified.....		149.90
Loss on hospital operation.....		154.50
	1.39	<u>9,706.08</u>
Net cost of construction of project June 30, 1919.....	¹ 1.39	<u>371,867.31</u>

¹ Deduct.

Statement of cost by calendar years, Hondo project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending Dec. 31—			
1903.....	\$4,890.15		\$4,890.15
1904.....	30,196.06		30,196.06
1905.....	160,368.14		160,368.14
1906.....	153,919.88		153,919.88
1907.....	9,339.40		9,339.40
1908.....	6,648.51	\$6,369.07	13,017.58
1909.....	{ 4,943.63 }	5,149.23	{ 10,092.86 }
1910.....	{ 23,693.59 }		{ 23,693.59 }
1911.....	4,521.08	4,521.08	9,042.16
1912.....	5,526.93	5,526.93	11,053.86
1913.....	4,085.69	4,085.69	8,171.38
1914.....	5,745.12	2,480.47	8,225.59
1915.....	1 26,974.42	3,514.95	{ 1 26,974.42 }
1916.....		5,031.64	5,031.64
1917.....		4,483.98	4,483.98
1918.....		918.67	918.67
Total.....	339,491.68	42,081.71	381,573.39

¹ Deduct.² Collection from bonding company.³ Transfer cost of operation and maintenance during construction.*Statement of cost by fiscal years, Hondo project.*

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending Dec. 31—			
1904.....	\$4,890.15		\$4,890.15
1905.....	82,934.32		82,934.32
1906.....	239,502.12		239,502.12
1907.....	29,612.07		29,612.07
1908.....	1,227.78	\$3,993.42	5,221.20
1909.....	{ 23,693.59 }	5,022.77	{ 28,716.36 }
1910.....	{ 214.40 }	5,280.96	{ 5,495.36 }
1911.....	1 62.05	3,464.08	3,626.13
1912.....	76.41	3,748.65	3,825.06
1913.....	2,564.03	2,986.41	5,550.44
1914.....	1,379.29	3,206.02	4,585.31
1915.....	444.88	5,083.51	5,528.39
1916.....		4,123.77	4,123.77
1917.....		3,215.38	3,215.38
1918.....		1 48.26	1 48.26
Total.....	339,491.68	42,081.71	381,573.39

¹ Deduct.² Collection from bonding company.*Summary of general data for Lawton project to end of fiscal year 1919.***Finances:**

Net cost to end of fiscal year 1919.....	\$13,897.86
Appropriation for fiscal year 1919, total.....	1,000.00
Allotment for fiscal year 1919.....	500.00
Gross cost to end of fiscal year 1919.....	13,907.61
Appropriation, fiscal year 1919.....	1,000.00
Expenditures during fiscal year chargeable to 1919 appropriation: Disbursements.....	51.18
Unencumbered balance, July 1, 1919.....	948.82

SECONDARY PROJECTS.

433

Condensed balance sheet, Lawton project, June 30, 1919.

Gross construction cost.....	\$13,907.61	
Less profit on hospital operations.....	9.75	
Net construction cost.....		<u>\$13,897.86</u>
Capital investment:		
Disbursements and transfer vouchers received.....	14,774.99	
Collections and transfer vouchers issued.....	877.13	
Net investment.....		<u>13,897.86</u>

Feature costs, Lawton project, to June 30, 1919.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$99.69	\$9,265.96
Canal system:		
Diversion dam.....		293.80
Main canal.....		2,080.68
		<u>2,374.48</u>
Lateral system.....		1,118.83
Plant accounts.....		132.79
Undistributed general expense.....		1,015.55
Gross cost to June 30, 1919.....	99.69	13,907.61
Less profit on hospital operations.....		9.75
Net cost to June 30, 1919.....	99.69	<u>13,897.86</u>

Statement of cost, Lawton project, by calendar years.

	Construction.	Total cost.
Year ending Dec. 31—		
1914.....	\$5,830.30	\$5,830.30
1915.....	2,339.98	2,339.98
1916.....	3,830.54	3,830.54
1917.....	1,535.21	1,535.21
1918.....	326.63	326.63
1919, January to June 30.....	44.95	44.95
Total.....	13,907.61	13,907.61

Statement of cost, Lawton project, by fiscal years.

	Construction.	Total cost.
Year ending June 30—		
1914.....	\$450.65	\$450.65
1915.....	7,447.10	7,447.10
1916.....	1,748.89	1,748.89
1917.....	3,999.31	3,999.31
1918.....	216.71	216.71
1919.....	44.95	44.95
Total.....	13,907.61	13,907.61

INDIAN IRRIGATION PROJECTS.

MONTANA, BLACKFEET (INDIAN) PROJECT.

R. M. SNELL, project manager, Browning, Mont.

LOCATION.

Counties: Glacier and Pondera.

Townships: 31 to 34 N., Rs. 5 to 10 W.; 29 N., R. 8 W.; 30 N., Rs. 6 to 9 W.; and 35 N., Rs. 6 and 7 W., Montana meridian.

Railroad: Great Northern.

Railroad stations and estimated population June 30, 1919: Browning, 700; Blackfoot, 50; Bombay; Seville; Cadmus; Glacier Park, 100; and Cutbank, 1,200.

WATER SUPPLY.

Source of water supply: Two Medicine River, Cutbank, Badger, Birch, Whitetail and Blacktail Creeks.

Area of drainage basins: 1,700 square miles.

Annual run-off in acre-feet: Cutbank Creek at Cutbank (971 square miles), 1906 to 1918, maximum 391,600, minimum 73,000, mean 146,390. Two Medicine River at Family (368 square miles) 1908 to 1918, maximum 411,940, minimum 194,600, mean 278,080. (The records for Cutbank Creek and Two Medicine River are for the years ending September 30, and do not include the run-off during the winter months.) Badger Creek near Family (224 square miles) 1907 to 1918. Records for this creek are incomplete. The maximum on record is 204,090 and the average for 7 years, when the most nearly complete records were kept, is 161,770. Birch Creek at Dupuyer (155 square miles) 1907 to 1915, mean 106,250.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to furnish water, season of 1919: 48,240 acres.

Area under water-right (allottees') applications, season of 1918: 2,578 acres.

Area under water-rental applications, season of 1918. 906 acres.

Area irrigated, season of 1918: 3,484 acres.

Length of irrigation season: May 1 to September 30, 153 days.

Average elevation of irrigable area: 3,850 feet above sea level.

Rainfall on irrigable area: 1909 to 1918, average 13.44 inches; 1918, 7.75 inches.

Range of temperature on irrigable area: -56° to 100° F.

Character of soil of irrigable area: Principally rich sandy loam; some gravelly loam and gumbo.

Principal products: Hay, grain, and vegetables.

Principal markets: Great Northern Railway towns from St. Paul to the Pacific coast. Local demand for hay for stock feeding.

LANDS OPENED TO IRRIGATION.

No lands have been opened to irrigation by public notice. Nearly all lands covered by canals are allotted to Indians.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys made in 1907.

Construction work on the Two Medicine unit begun in July, 1908.

Construction of Two Medicine Lake Dam begun in June, 1911; completed August, 1913.

Construction of the Badger-Fisher unit begun in June, 1911.

Construction of Birch Creek unit begun in August, 1915.

Two Medicine unit 44 per cent completed June 30, 1919.

Badger-Fisher unit, 57 per cent completed June 30, 1919.

Birch Creek unit, 77 per cent completed June 30, 1919.

Entire project 30 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Blackfeet project provides for five irrigation systems on the Blackfeet Indian Reservation, as follows: (1) The Cutbank north canal system heading on the left bank of Cutbank Creek and supplying water for 20,000 acres of land north and east of the creek, 11,000 acres of which are outside of the reservation; (2) the Cutbank south canal system heading on the right bank of Cutbank Creek and supplying water for 18,000 acres of land near Carlow and Seville stations on the Great Northern Railway; (3) the Two Medicine Canal systems, diverting from the left bank of the Two Medicine River and supplying water through the North Branch Canal, the Spring Lake Reservoir, and the South Branch Canal to 44,000 acres of land; (4) the Badger-Fisher Canal system, diverting water from the right bank of Badger Creek, supplying water direct through a feeder canal to 3,000 acres of land on the Piegan Flats and through the Four Horns supply canal and reservoir and the Fisher Canal to 30,000 acres of land between Badger and Birch Creeks, and (5) the Birch Creek canal system, diverting from the left bank of Birch Creek and supplying water to 3,500 acres of land between Birch and Blacktail Creeks. The United States claims all waste, seepage, spring, and percolating water arising within the project, and proposes to use such water in connection therewith.

The irrigable lands of the project are located, in general, in the southeastern portion of the Blackfeet Indian Reservation adjacent to the north bank of Cutbank Creek and between Cutbank Creek and Birch Creek. Of the above irrigation plan the first development of the Two Medicine Canal system has been completed, including 36 miles of main canal, with headworks and other structures and distribution system complete with structures to deliver water to approximately 24,000 acres of land. A storage reservoir has been constructed at lower Two Medicine Lake to furnish a maximum storage of 16,000 acre-feet of water for this unit. On the Badger-Fisher unit a small canal and lateral system has been constructed, with the exception of small laterals and structures to reach unallotted land, diverting water from Badger Creek direct to approximately 3,000 acres of the Piegan Flats. A supply canal, 12 miles long, diverting water to Four Horns Reservoir, has been completed to its first development. Temporary controlling works to Four Horns Lake have been completed, making available a reservoir of 4,000 acre-feet capacity. Water from this storage follows a natural channel to Blacktail Creek, from which it is diverted into the Fisher Canal, designed to irrigate about 30,000 acres of Fisher Flats. The Fisher Canal has been completed to its first development, both as to excavation and structures, to the end at mile 30. Excavation of a lateral system has been completed to cover approximately 18,000 acres of allotted land on the Fisher Flats. The larger structures on the lateral system have been completed and the smaller ones will be built as needed. The Birch Creek Canal and main lateral have been completed as to excavation to irrigate 2,600 acres of land. The larger structures on this system have been completed and the smaller structures will be built as needed.

Work for the immediate future includes the building of minor structures on the Fisher distribution system to complete the works to irrigate 18,000 acres, the building of minor structures on the Two Medicine and Birch systems as needed to reach allotted land, and the enlargement of a portion of Two Medicine Canal.

SUMMARY OF GENERAL DATA FOR BLACKFEET (INDIAN) PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	118,500
Public land entered to June 30, 1919.....	11,000
Public land withdrawn on June 30, 1919.....	50,020
Indian land June 30, 1919.....	57,480
Acreage service could have supplied in season of 1918.....	¹ 48,240
Estimated acreage service can supply in season 1919.....	48,240
Estimated acreage service can supply in season 1920.....	48,240
Acreage irrigated season of 1918.....	3,484
Acreage cropped under irrigation season of 1918.....	2,989

¹ The 48,240 acres given as the area for which the service can now supply water is the area covered by distribution systems which are either complete or complete except minor structures and extensions. The main canals are not constructed to a capacity to deliver water to this area, but will supply water to only about 25,600 acres, provided that much were actually irrigated.

Crops:

Value of irrigated crops season of 1918.....	\$48,190.00
Value of irrigated crops per acre cropped.....	16.12

Finances:

Net construction cost to June 30, 1919.....	\$1,044,093.14
Per cent completed on June 30, 1919.....	30
Appropriated for fiscal year 1920.....	\$50,000.00
Estimated per cent complete by June 30, 1920.....	32
Proposed appropriation for fiscal year 1921.....	\$50,000.00
Estimated per cent complete by June 30, 1921.....	34

Appropriation fiscal year 1919.....	\$50,000.00
Increase miscellaneous collections.....	1,725.51
Balance of previous appropriations.....	16,052.19
	\$67,777.70

Expenditures chargeable to 1919 appropriation:

Disbursements.....	34,899.60
Current liabilities.....	5,279.45
Contingent liabilities.....	14,406.22
	54,584.27

Unencumbered balance on July 1, 1919.....	13,193.43
---	-----------

Water-rental charges:

Accrued to June 30, 1919.....	1,549.75
Collected to June 30, 1919.....	1,549.75

CONSTRUCTION DURING FISCAL YEAR.

Two Medicine system.—Minor structures were placed and lateral extensions excavated where necessary to deliver water to additional allotted land.

Badger-Fisher system.—Minor structures including concrete drops, checks, and lateral turnouts and timber checks and farm turnouts were constructed to deliver water to land being irrigated.

No new construction jobs were commenced and none were completed.

OPERATION AND MAINTENANCE.

The Two Medicine, Badger-Fisher, and Birch Creek systems were operated during the season of 1918. The weather was dry throughout the season. The spring was rather cold and backward, and a frost occurred September 14 which destroyed a good many crops. There was no water shortage, but on account of general unfavorable weather conditions and inexperienced irrigators the crop results were not entirely satisfactory. The same systems are being operated during the 1919 season with about double the amount of land under cultivation.

Historical review, Blackfeet project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which the service was prepared to furnish water.....	26,640	26,640	46,640	48,240	48,240	48,240
Acreage irrigated.....	675	1,618	2,102	2,448	3,484	¹ 6,500
Miles of canal operated.....	44	65	109	125	153	¹ 200
Water diverted (acre-feet).....	15,380	8,254	7,036	21,284	22,324	.....
Water delivered to land (acre-feet).....	4,430	2,970	1,735	2,663	6,205	.....
Per acre of land irrigated (acre-feet).....	.....	1.83	.83	1.08	1.88	.....

¹ Estimated.

SETTLEMENT.

Lands under the project have not yet been opened for settlement. About 55,000 acres have been allotted to Indians. The allottees generally have not settled on their allotments or farmed them. Several sizable tracts are being farmed by white renters.

Settlement data, Blackfeet project.

Item.	1913	1914	1915	1916	1917	1918	1919
Total number of farms on project.....	3,000	3,000	3,000	3,000	3,000	3,000	2,900
Population.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Number of irrigated farms.....		12	18	79	91	125	200
Operated by owners or managers.....		12	16	79	84	78	100
Operated by tenants.....			2		7	49	100
Population.....		40	50	170	180	229	300
Number of towns.....	4	4	4	4	4	4	4
Population.....	300	300	375	1,750	1,900	2,000	2,050
Total population in towns and on farms.....	300	340	425	1,920	2,070	2,229	2,350
Number of schools.....	1	1	1	5	3	4	4
Number of churches.....	2	2	3	8	8	8	8
Number of banks.....				3	4	4	4

¹ Not opened.² Estimated.

PRINCIPAL CROPS.

Wheat, flax, timothy, alfalfa, and native hay are the principal crops irrigated. All of these crops do well when proper farming and irrigation methods are practiced. The yields during 1918 were much less than was expected, due to early frosts, which injured most flax crops and a large percentage of the wheat crops. There is a tendency to increase the area of timothy and alfalfa, which eventually will probably be the principal irrigated crops.

Crop report, Blackfeet (Indian) project, Montana, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa.....	28	Ton.....	72	1.50	\$25.00	\$1,800	\$37.50	
Barley.....	18	Bushel....	100	5.50	1.10	110	6.11	
Flax.....	276	do.....	1,290	4.70	3.34	4,322	15.65	
Garden.....	22	Acre.....	-----	78.00	78.00	1,716	78.00	
Hay, grain.....	589	Ton.....	337	.57	16.00	5,392	9.15	
Hay, native.....	495	do.....	285	.57	19.00	5,415	10.94	
Oats.....	30	Bushel....	735	24.50	.90	661	22.05	
Pasture.....	831	Acre.....	-----	10.00	-----	8,310	10.00	
Potatoes.....	10	Bushel....	600	.60	.90	540	54.00	
Timothy.....	35	Ton.....	52	1.49	25.00	1,300	37.14	
Wheat.....	635	Ton straw.....	330	.52	5.50	1,815	2.86	
		Bushel....	8,755	13.80	1.92	16,809	26.60	
Total cropped acreage.....	2,989	Total and average.....					48,190	16.12
		Areas.			Acres.	No. farms.	Per cent of project.	
For fall plowing land-seeded alfalfa.....	495	Total irrigable area farms reported..			5,180	125	10.5	
		Total irrigated area farms reported..			3,484	125	7.2	
		Under water-right applications (allottees).....			2,578	88	5.3	
		Under rental contracts.....			906	37	.018	
Total irrigated acreage.....	3,484	Total cropped area farms reported..			2,989	125	6.1	

FINANCIAL STATEMENT.

Condensed balance sheet, Blackfeet project, June 30, 1919.

Cash.....		\$412.50
Inventory of stock on hand.....		10,985.57
Accounts receivable.....		81.19
Undelivered orders.....		14,406.22
Gross construction cost.....	\$1,048,249.69	
Less construction revenue earnings.....	4,156.55	
Net construction cost.....		1,044,093.14
Accounts payable.....		5,282.93
Contingent obligations.....		14,817.72
Capital investment:		
Disbursement, transfer and joint constructions vouchers received.....	1,060,026.21	
Collection, transfer, refund and joint construction vouchers received.....	10,149.24	
Net investment.....		1,049,876.97

Feature costs of Blackfeet (Indian) project.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$526.60	\$8,140.27
Storage system:		
Two Medicine Unit.....	20,995.80	159,253.90
Spring Lake Reservoir, survey and design.....	40.17	1,930.80
Badger Creek Reservoir, survey and design.....	6.45	309.07
Four Horns Reservoir, survey and design.....	27.87	1,336.49
Four Horns Reservoir Dam.....	237.81	11,402.81
Guardipee Reservoir.....		597.00
Subtotal storage system.....	21,308.10	174,830.07
Canal system:		
Cut Bank unit, surveys and designs.....	19.91	1,001.64
Birch Creek unit, surveys and designs.....	34.46	1,652.32
Birch Creek Canal, headworks.....	45.84	2,197.97
Birch Creek Main Canal.....	181.43	8,699.48
Carlou unit, surveys and designs.....	12.92	619.68
Two Medicine Canal.....	6,762.19	299,481.74
Two Medicine headworks.....		10,683.55
Culvert under G. N. Railway, Seville.....	30.26	1,450.71
Two Medicine unit, main canal construction.....		842.25
Piegan Canal, headworks.....	34.87	1,671.83
Piegan Canal.....	206.40	206.40
Four Horns Supply Canal.....	2,020.70	102,063.82
Four Horns Supply Canal, headworks.....	184.15	8,829.58
Fisher Main Canal.....	6,077.60	149,518.66
Black Tail diversion.....	316.87	15,240.37
Siphon, White Tail Creek Crossing.....	287.75	13,797.51
Subtotal canal system.....	16,215.35	623,947.51
Lateral system:		
Two Medicine lateral system.....	578.52	27,739.04
Two Medicine unit, lateral system, surveys, testing, etc.....	68.39	68.39
Two Medicine, construction.....	1,884.72	178.91
Two Medicine structures, timber.....	2,387.71	2,387.71
Piegan lateral system.....	348.52	16,711.04
Fisher Canal lateral system.....	5,095.92	78,586.52
Fisher Canal drop, north lat., Sta. NO.....	949.44	6,210.58
Fisher Canal, drop station 0, lateral K.....	4,522.75	4,522.75
Fisher Canal, drop station 186, lateral K.....	3,474.85	3,474.85
Badger-Fisher laterals.....	683.82	1,215.87
Badger-Fisher minor structures, concrete.....	7,165.59	7,165.59
Badger-Fisher minor structures, timber.....	2,266.56	2,266.56
Badger-Fisher surveys, testing, etc.....	34.67	34.67
Birch Creek lateral system, surveys and designs.....	81.09	1,031.44
Birch Creek lateral system.....	1,063.65	6,089.37
Birch Creek minor structures, concrete.....	506.29	506.29
Birch Creek minor structures, timber.....	1,233.32	1,233.32
Subtotal, lateral system.....	16,230.23	159,375.90

¹ Deduct.

Feature costs of Blackfeet (Indian) project—Continued.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Permanent improvements:		
Buildings.....	\$11,603.98	
Roads, Fisher Canal distribution system.....	12,836.38	
Two Medicine division.....	25,091.65	
Roads, Piegán distribution system.....	1,202.10	
Wells, Two Medicine system.....	1,552.21	
Browning to Robare road.....		\$67.43
Bridge across Badger Creek.....	62.26	1,135.59
Camp site near Family.....		60.00
Subtotal, permanent improvements.....	141,824.06	1,263.02
Telephone system.....	172.01	8,247.82
Operation and maintenance during construction.....	14,396.14	59,060.18
Total cost of construction features.....	27,014.37	1,034,864.77
Plant account.....		9,368.05
Undistributed clearing account.....		4,016.87
Gross construction cost.....	27,014.37	1,048,249.69
Less revenues earned during construction period:		
Rentals of buildings.....	3.00	959.35
Rentals of irrigation water.....	1,033.75	1,549.75
Rentals of telephones and tolls.....	27.75	796.80
Contractor's freight refunds.....	1.48	35.56
Other revenues, unclassified.....		7.50
Profit on hospital operations.....	102.44	806.12
Other profits on operations, unclassified.....	6.15	11.47
Total.....	1,172.61	
Net construction cost.....	25,841.76	1,044,093.14

¹ Deduct.

NOTE.—No work done on the following features—cost for the year represents adjustments only: Spring Lake Reservoir, Badger Creek Reservoir, Four Horns Reservoir, Four Horns Reservoir dam, understorage system; all of canal system; Two Medicine lateral system, Piegán lateral system; Fisher Canal lateral system, under lateral system; all of permanent improvements; and telephone system.

Two Medicine construction, lateral system, actual cost for year, \$145.92; Two Medicine structures timber, actual cost for year, \$206.12; Fisher Canal drop station 0, lateral K, actual cost for year, \$852.48; Fisher Canal drop, station 186, lateral K, actual cost for year, \$369.16; Birch Creek lateral system, actual cost for year, \$560.13. Balance of cost shown for these features represents adjustments.

Statement of cost by calendar years, Blackfeet project.

	Construction.	Operation and Maintenance during con- struction.	Total cost.
Year ending Dec. 31—			
1907.....	\$1,769.20		\$1,769.20
1908.....	59,192.31		59,192.31
1909.....	109,900.55		109,900.55
1910.....	152,674.36		152,674.36
1911.....	173,873.96	\$8,372.50	181,746.46
1912.....	189,797.18	4,696.85	194,494.03
1913.....	152,716.96	1,154.75	153,871.71
1914.....	75,224.26	4,334.33	79,558.59
1915.....	35,548.24	2,026.60	37,574.84
1916.....	11,489.05	4,836.78	16,325.83
1917.....	22,491.46	12,395.63	10,095.83
1918.....	31,423.31	13,936.66	45,359.97
January to June 30, 1919.....	5,186.67	7,306.08	12,492.75
Subtotal.....	975,804.59		1,034,864.77
Plant and clearing accounts.....	13,384.92		13,384.92
Total.....	989,189.51	59,060.18	1,048,249.69

¹Deduct.

Statement of cost by fiscal years, Blackfeet project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1908.....	\$9,047.80		\$9,047.80
1909.....	86,251.96		86,251.96
1910.....	146,464.17		146,464.17
1911.....	140,737.83		140,737.83
1912.....	213,957.37	\$1,731.57	215,688.94
1913.....	166,063.04	11,977.10	178,040.14
1914.....	132,594.42	4,068.12	136,662.54
1915.....	36,674.44	1,784.35	38,458.79
1916.....	24,066.27	4,108.95	28,175.22
1917.....	5,484.27	10,401.33	15,885.60
1918.....	1,234.79	10,582.62	11,817.41
1919.....	12,628.23	14,386.14	27,014.37
Subtotal.....	975,804.59		1,034,864.77
Undistributed plant and clearing account.....	13,384.92		13,384.92
Total.....	989,189.51	59,060.18	1,048,249.69

Estimated cost of contemplated work, Blackfeet project, during fiscal year 1920.

Principal features.	Sub-features.	Principal features.
Examination and surveys:		
Stream gauging.....	\$900	
Miscellaneous surveys.....	200	\$1,000
Canal system, Two Medicine Canal.....		23,800
Lateral system: Lateral extensions and construction of minor structures.....		2,200
Telephone system: Extension of Two Medicine line.....		2,000
Operation and maintenance during construction (water-rental basis):		
Operation.....	5,500	
Maintenance.....	14,500	20,000
Reimbursable accounts.....		1,000
Total.....		50,000

MONTANA, FLATHEAD (INDIAN) PROJECT.

F. T. CROWE, project manager, St. Ignatius, Mont.

LOCATION.

Counties: Flathead, Missoula, Sanders.

Townships: 15 to 25 N., Rs. 17 to 25 W., Montana meridian.

Railroad: Northern Pacific.

Towns and estimated population, June 30, 1919: Evaro, 100; Arlee, 150; Ravalli, 75; Dixon, 150; Perma, 75; Camas, 100; Dayton, 50; Big Arm, 50; Polson, 2,500; St. Ignatius, 650; Ronan, 700; Hot Springs, 300; Charlo, 75; and Pablo, 275.

WATER SUPPLY.

Source of water supply: Jocko and Little Bitter Root rivers; Mud, Crow, Post, Mission, Dry, Finley, Agency, Big Knife, Valley, and Falls creeks; and about 60 smaller streams.

Area of drainage basin: 675 square miles.

Annual run-off in acre-feet of creeks, 1909 to 1918. Maximum, 473,500; minimum, 231,100; mean, 304,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water season of 1919: 91,000 acres.

Area under water-rental applications, season 1919 (to June 30): 60,000 acres.

Length of irrigating season: May 1 to September 30, 153 days.

Average elevation of irrigable area: 3,000 feet above sea level.

Rainfall on irrigable area: At St. Ignatius (Mont.) station, 1909 to 1918, average, 17.35 inches; 1918, 11.99 inches.

Range of temperature on irrigable area: -30° to 96° F.

Character of soil of irrigable area: Varies from light sandy loam to heavy clay.

Principal products: Grain, hay, vegetables, fruit, and cattle.

Principal markets: Missoula, Butte, and Anaconda, Mont., and other mining and lumber towns and camps.

LANDS OPENED FOR IRRIGATION.

Dates of public notices and orders: Proclamation of the President May 22, 1909, opened lands to filing under certain rules as to registration, etc., first filing to be May 2, 1910.

Location of lands opened: Tps. 17 to 24 N., Rs. 19 to 24 W., Montana meridian.

Limit of area of farm units: 160 acres; average irrigable, about 40 acres.

Duty of water: Works will provide about 1.3 acre-feet per acre per annum at the farm.

Building charges: Not fixed.

Annual operation and maintenance charges: Rental basis, 50 cents per acre-foot.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys begun in 1907.

Construction authorized and first appropriation made by act of Congress approved April 30, 1908.

Construction begun, Jocko, Mission, and Polson divisions, 1909.

Land open to homestead entry, May, 1910.

Irrigation in Jocko and Mission divisions begun in 1910.

Irrigation in Post division begun in 1911.

Kickinghorse feeder canal completed in 1912.

Irrigation in Polson and Pablo divisions begun in 1913.

Entire project 53.1 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan of the Flathead project provides for the irrigation of about 134,500 acres of land in various parts of what was the Flathead Indian Reservation, water being diverted from creeks and rivers rising in the Mission Mountains or in the Little Bitter Root drainage area and conducted by canals directly to the land and to reservoirs for the storage of flood waters. About eight reservoirs will be constructed. Some of these are lakes, the capacity of which will increase, and others natural basins, which will require only the building of embankments at low points. Irrigable tracts on the Jocko, Mission, Post, Pablo, and Polson divisions, which contain the largest percentage of irrigable land allotted to the Indians, have been selected for the first development. The United States claims all waste, seepage, unappropriated spring and percolating water arising within the project and proposes to use such water in connection therewith.

The following principal features have been completed: Two distributing systems covering approximately 13,500 acres in Jocko Valley, taking water from Jocko River and tributaries; a distribution system covering about 10,600 acres and taking water from Mission Creek; a distribution system lying below Kickinghorse Dam site, covering about 2,000 acres; a distribution system lying under the Ninepipe Reservoir, covering about 21,700 acres, which, together with the previous-mentioned tract, takes water from Post Creek and tributaries; a distribution system taking water from Crow Creek for about 5,000 acres in Moiese Valley; a distribution system under Pablo Reservoir, taking water from Post, Crow, and Mud Creeks for about 31,700 acres; and a distribution system taking water from the last-named creeks for about 1,200 acres near Polson and distributary works from the Little Bitter Root River for 5,000 acres in the Camas Division. Five storage reservoirs have been constructed: Pablo Reservoir for 13,000 acre-feet; Ninepipe for 5,000 acre-feet; Tabor for 12,500 acre-feet; McDonald for 2,000 acre-feet; and Little Bitter Root Lake for 18,000 acre-feet. The Pablo Feeder Canal has been built from 2 miles south of Post Creek to Pablo Reservoir, a distance of about 29 miles, picking up the waters of all streams flowing from the mountains. The section of the Pablo Feeder between Dry and Post Creeks has been built for a distance of about 8.6 miles.

SUMMARY OF GENERAL DATA FOR FLATHEAD PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	134, 500
Public land entered to June 30, 1919.....	41, 125
Public land withdrawn on June 30, 1919.....	5, 320
State land unsold June 30, 1919.....	5, 810
Indian land June 30, 1919.....	77, 430
Private land June 30, 1919.....	4, 815
Acreage service could have supplied in season of 1918.....	84, 300
Estimated acreage service can supply in season 1919.....	91, 000
Estimated acreage service can supply in season 1920.....	97, 000
Acreage irrigated season of 1918.....	27, 128
Acreage cropped under irrigation, season of 1918.....	26, 163

Crops:

Value of irrigated crops, season of 1918.....	\$700, 182
Value of irrigated crops per acre cropped.....	\$26.78

Finances:

Net construction cost to June 30, 1919.....	\$3, 675, 525. 61
Per cent completed on June 30, 1919.....	53. 1
Appropriated for fiscal year 1920.....	\$375, 000
Estimated per cent complete by June 30, 1920.....	58. 5
Proposed appropriation for fiscal year 1921.....	\$1, 000, 000
Estimated per cent complete by June 30, 1921.....	73. 1

Unexpended balance July 1, 1918.....	\$52, 951. 93
Appropriation fiscal year 1919.....	375, 000. 00
Increase under 10 per cent provision.....	16, 798. 15
Increase miscellaneous collections, if authorized.....	38, 227. 79
	\$482, 977. 87

Expenditures chargeable to 1919 appropriation:

Disbursements, regular.....	\$384, 900. 33	
Disbursements, increase.....	16, 798. 15	
Current liabilities.....	40, 774. 73	
Contingent liabilities.....	15, 160. 71	
		\$457, 633. 92

Unencumbered balance on July 1, 1919..... 25, 343. 95

Repayments:

Water-rental charges—		
Accrued to June 30, 1919.....	\$65, 794. 93	
Collected to June 30, 1919.....	48, 411. 10	
Uncollected to June 30, 1919.....		17, 383. 83

Drainage:

Estimated acreage damaged by seepage to June 30, 1919.....	440	
Miles of drains built to June 30, 1919—		
Open.....	0. 18	
Closed.....	2. 97	
		3. 15
Estimated acreage protected by drains to June 30, 1919.....	1, 240	
Estimated acreage to be protected by authorized system.....	1, 240	
Cost of drainage works to June 30, 1919.....	\$53, 092. 78	

CONSTRUCTION DURING FISCAL YEAR.

Mission division.—Steam shovel excavation was continued on the Pablo Feeder Canal between Mission and Post Creeks. Preliminary work was done on the Mission A lateral system.

Post division.—Work was started on the enlargement of Post Lateral A but the necessity of using the lateral for irrigation caused a suspension of work after one-quarter of the estimated yardage had been removed. Camp was established and hauling of material and equipment started at McDonald Lake Dam. It is planned to increase the 2,000 acre-feet storage here to 8,000 acre-feet. Siphons on 44MA and 46MA were completed.

Pablo division.—South Pablo Dam was raised and enlarged, increasing the capacity of South Pablo Reservoir from 7,000 to 13,000 acre-feet.

Camas division.—Little Bitter Root Lake Dam was raised sufficiently to increase the storage in the lake from 9,000 to 18,000 acre-feet. Government forces have continued work on the Camas lateral system.

SEEPAGE AND DRAINAGE.

Ten wells were drilled in the Polson drainage district in an effort to relieve the seepage situation. These wells have continued to flow since their drilling. The conditions and water levels of the district are practically unchanged. No new seeped areas have appeared.

BOARD MEETINGS.

Date.	Topic.	Personnel.
Mar. 24, 25, 1919.....	Outlining work for irrigation season of 1919.....	Project employees.

OPERATION AND MAINTENANCE.

During the calendar year 1918 occurred the least precipitation of the 10 years during which records have been kept at the local office. Special efforts were made in the spring to induce an early use of water. Consequently no shortage of irrigation water prevailed and the water was delivered on demand; 833 farms were irrigated with an acreage of 27,128 and water delivery of 34,696 acre-feet or 1.28 acre-feet per acre irrigated. Grain and hay are the principal crops.

Historical review, Flathead project.

Item.	1913	1914	1915	1916	1917	1918	1919 ¹
Area for which service was prepared to supply water (storage incomplete).....	42,400	48,900	52,400	66,000	80,300	84,300	91,000
Acreage irrigated.....	4,621	6,416	3,242	4,373	15,863	27,128	29,882
Miles of canal operated.....	180	233	201	232	364	674	900
Water diverted (acre-feet).....	22,945	46,329	21,029	23,942	54,853	84,358	90,000
Water delivered to the land (acre-feet).....	6,104	8,752	3,637	5,751	21,691	34,696	28,212
Per acre of land irrigated (acre-feet).....	1.30	1.36	1.12	1.23	1.37	1.28	0.94

¹ To June 30, 1919.² Estimated.

SETTLEMENT.

The settlement progress for the year has been slight. Considerable land has changed ownership through private sales and public sales of Indian lands; 4,612 acres of Indian lands were sold at an average price of \$28 per acre. Many improvements have been made on the farms of the project.

Settlement data, Flathead project.

Item.	1914	1915	1916	1917	1918	1919 ¹
Total number of farms on project						
Irrigable ²	2,980	2,980	2,980	2,630	2,630	2,630
Population.....	13,855	14,000	14,000	14,500	14,500	14,500
Number of irrigated farms.....	223	185	308	567	833	850
Operated by owners or managers.....	188	159	219	425	670	650
Operated by tenants.....	35	26	84	142	163	200
Population.....	578	433	627	1,319	1,679	1,700
Number of towns.....	10	11	12	12	14	14
Population.....	2,842	3,147	3,460	4,000	4,325	5,250
Total population in towns and farms.....	16,697	17,147	17,460	18,500	18,825	19,750
Number of public schools.....	36	48	51	55	60	55
Number of churches.....	14	14	15	15	15	16
Number of banks.....	9	9	9	9	11	11
Total capital stock.....	\$205,000	\$205,000	\$205,000	\$205,000	\$221,000	\$250,000
Amount of deposits.....	\$585,870	\$495,000	\$745,732	\$1,283,988	\$1,011,177	\$1,318,907
Number of depositors.....	2,614	2,608	3,669	4,608	4,384	4,656

¹ June 30, 1918.² Includes both dry and irrigated farms.³ Estimated.

PRINCIPAL CROPS.

The crop conditions for 1918 were far more favorable than in 1917. The average crop value per acre amounted to \$26.78 in 1918 as compared with \$18.21 in 1917. Hay and grain brought very good prices. There has been an increase in the number of live stock and an increase in total value of approximately 50 per cent.

Crop report, Flathead (Indian) project, Montana, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	1,564	Ton.....	3,609	2.3	\$25.00	\$90,225	\$57.50
Apples.....	3.50	Pound.....	7,604	2,172	.02	152	43.44
Barley.....	184.50	Bushel.....	2,940	15.75	1.50	4,410	23.63
Beans.....	49	do.....	320	6.5	7.00	2,240	45.50
Beets, sugar.....	170	Ton.....	1,723	10.2	10.00	17,230	102.00
Clover hay.....	372	do.....	854	2.3	25.00	21,350	57.50
Corn, Indian.....	11.50	Bushel.....	286	24.8	1.70	486	42.16
Corn fodder.....	56	Ton.....	243	4.3	18.00	4,374	77.40
Garden.....	266	Acre.....				35,079	132.00
Hay.....	3,385	Ton.....	3,222	.95	25.00	80,550	23.75
Oats.....	2,571	Bushel.....	49,412	19.4	.85	42,000	16.49
Onions.....	5	do.....	60	12	1.80	108	21.60
Pasture.....	2,654	Acre.....				12,704	4.80
Peas.....	74	Bushel.....	629	8.5	4.00	2,516	34.00
Potatoes.....	224	do.....	29,256	131	1.25	36,570	163.75
Rye.....	21	do.....	153	7.3	1.50	230	10.95
Spelts.....	3	do.....	100	33	1.00	100	33.00
Wheat.....	16,004	do.....	179,470	11.2	1.95	349,966	21.85
Less duplicated areas.....	27,619 1,456						
Total cropped acreage.....	26,163		Total and average.....			700,182	26.78
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area farms reported ..		46,568	833	35
Young alfalfa.....	674		Total irrigated area farms reported ..		27,128	833	20
Clover, young.....	20		Under water-right applications.....				
Miscellaneous.....	342		Under rental contracts.....		27,128	833	20
Nonbearing orchard.....	108						
Less duplicated areas.....	179		Total cropped area farms reported...		26,163	833	19
Total irrigated acreage.....	27,128						

FINANCIAL STATEMENT.*Condensed balance sheet, Flathead (Indian) project, June 30, 1919.*

Cash.....	\$942.85
Inventory of materials and supplies on hand.....	86,007.10
Accounts receivable.....	18,078.66
Construction work contracted.....	15,160.71
Gross construction cost.....	\$3,761,876.67
Less construction revenue earnings and cost adjustments.....	86,351.06
Net construction cost.....	3,675,525.16
Accounts payable.....	40,774.73
Contingent obligations.....	16,039.53
Collections and contracts of specific amounts for repayments to Indian fund.....	565.25
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	\$3,895,988.35
Collection, transfer, refund, and joint construction vouchers issued.....	157,652.93
Net investment.....	3,738,335.42

Feature costs of Flathead project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$4,955.36	53,997.60
Storage system:		
Mission division—		
Surveys.....		15,652.24
Tabor Reservoir tunnel and controlling works.....	441.18	152,188.97
Post division—		
Surveys.....	142.68	11,292.83
Ninepipe Reservoir Dam and controlling works.....		51,787.21
Ninepipe feeder canal.....		3,757.71
Kickinghorse feeder canal.....		55,083.01
McDonald Lake Reservoir—		
Controlling works.....		29,395.74
Outlet canal.....		25,661.41
Dam.....	408.28	408.28
Crow division: Crow Reservoir (surveys only).....		1,030.00
Pablo division—		
Surveys.....		26,890.09
North Pablo Dam and controlling works.....		73,235.47
Middle Pablo Dam.....		4,619.96
South Pablo Dam and controlling works.....	144,532.79	279,564.62
Horte Dam.....		5,507.52
Polson division: Survey.....		490.15
Camas division—		
Surveys.....		11,340.84
Little Bitter Root Dam and controlling works.....	13,253.71	28,865.57
Hubbard Dam and controlling works.....		17,011.68
Total storage system.....	158,778.64	793,783.30
Canals system:		
Mission division—		
Surveys.....	390.45	810.73
Pablo feeder canal, excavation.....	62,329.73	86,822.92
Mission Creek headworks.....	11,973.44	11,973.44
Headworks, Pablo feeder.....		227.54
Minor structures, Pablo feeder.....	2,324.76	2,545.21
Roads, Pablo feeder canal.....	486.96	688.57
Pablo division—		
Surveys.....		26,806.67
Pablo feeder canal.....	7,635.91	183,096.73
By-pass canal.....		4,640.83
Drops (4).....		14,375.89
Division works (4).....		31,420.13
Wasteways (2).....		2,660.00
Camas division—		
Surveys.....		3,011.12
Camas A diversion dam and headworks.....		8,559.37
Camas A tunnel.....		49,929.13
Camas A canal.....	21,136.60	124,340.09
Camas A flume, stations 58 to 107.....		44,934.26
Camas A canal, lined section.....		30,872.56
Minor structures.....	2,649.43	2,649.43
Wasteway, station 37.....		1,536.34
Total canals system.....	108,927.28	631,902.96
Laterals system:		
Jocko division.....	2,510.66	161,058.51
Mission division.....	6,373.53	140,601.79
Post division.....	15,070.87	302,088.39
Moiese division.....	26,708.86	320,258.07
Crow division.....	1,463.47	6,963.47
Pablo division.....	10,673.91	405,832.57
Valley View division.....	1,395.44	150,606.39
Polson division.....	272.11	16,022.61
Camas division.....	22,747.98	191,230.72
Total lateral system.....	85,430.95	1,004,569.52
Drainage system: Polson division—Polson drain.....	1,518.77	53,092.78
Power system: Polson division—Newell tunnel.....		101,685.11
Farm units: Project as a whole.....	4,236.00	27,343.09

† Deduct.

Feature costs of Flathead project—Continued.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Permanent improvements and lands:		
Headquarters office and camp buildings.....		\$4,040.00
Mission division—		
Tabor Reservoir—camp buildings.....		2,530.12
Tabor Reservoir road.....		7,658.41
Post division—Ninepipe Camp and buildings.....		6,974.61
Moose division—		
River camp buildings.....		332.46
Moose camp buildings.....		1,526.37
Pablo division, Horte camp buildings and grounds.....	\$549.33	1,929.45
Camas division, Lonepine camp buildings and grounds.....		6,855.01
Jocko division, Jocko camp buildings and grounds.....		440.58
Horte division, watermaster's cottage.....	3,444.49	3,444.49
Total permanent improvements and land.....	3,993.82	35,731.50
Telephone system: Project as a whole.....		17,016.89
Operation and maintenance during construction.....	63,041.39	263,571.32
Total cost of construction features.....	430,882.81	3,677,699.07
Plant accounts.....		98,063.13
Unadjusted clearing accounts.....		¹ 13,885.53
Gross cost.....	430,882.81	3,761,876.67
Less construction revenue earnings:		
Rental of buildings.....	852.78	8,458.51
Rental of grazing lands.....		1,649.75
Rental of irrigating water.....	17,370.45	65,794.93
Rental of telephone lines.....		5,637.28
Contractors' freight refunds.....	2,160.60	4,944.64
Revenues, miscellaneous.....		2,633.45
Hospital gains.....	¹ 964.45	351.33
Farming operations.....	¹ 2,052.71	¹ 2,052.71
Field cost adjustment.....	¹ 1,066.12	¹ 1,066.12
Total revenues.....	16,300.55	86,351.06
Net construction cost.....	414,582.26	3,675,525.61

Statement of costs, by calendar years, Flathead (Indian) project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1908.....	\$25,303.90		\$25,303.90
1909.....	149,160.88		149,160.88
1910.....	242,779.63		242,779.63
1911.....	416,550.60	\$4,719.97	421,270.57
1912.....	211,971.63	8,614.63	220,586.26
1913.....	166,360.35	18,789.00	185,149.35
1914.....	186,724.49	24,423.08	211,147.57
1915.....	156,159.17	29,061.80	185,220.97
1916.....	379,881.65	28,774.13	408,655.78
1917.....	870,509.53	51,063.80	921,593.33
1918.....	494,912.70	65,969.59	560,882.29
June 30, 1919 (6 months).....	113,813.22	32,135.32	145,948.54
Subtotal.....	3,414,127.75	263,571.32	3,677,699.07
Unadjusted clearing accounts.....	¹ 13,885.53		¹ 13,885.53
Plant accounts.....	98,063.13		98,063.13
Total.....	3,498,305.35	263,571.32	3,761,876.67

¹ Deduct.

Statement of costs by fiscal years, Flathead (Indian) project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1908.....	\$3,347.89	.....	\$3,347.89
1909.....	66,571.91	.....	66,571.91
1910.....	185,377.41	.....	185,377.41
1911.....	341,840.64	.....	341,840.64
1912.....	341,334.95	\$5,148.67	349,483.62
1913.....	162,105.21	14,075.25	176,180.46
1914.....	243,227.82	19,849.42	263,077.24
1915.....	104,267.28	28,860.76	133,118.04
1916.....	228,229.35	27,354.10	255,583.45
1917.....	656,044.72	29,562.42	685,607.14
1918.....	713,949.15	72,679.31	786,628.46
1919.....	367,841.42	63,041.39	430,882.81
Subtotal.....	3,414,127.75	263,571.32	3,677,699.07
Unadjusted clearing accounts.....	¹ 13,885.53	.....	¹ 13,885.53
Plant accounts.....	98,063.13	.....	98,063.13
Total.....	3,498,305.35	263,571.32	3,761,876.67

¹ Deduct.*Estimated cost of contemplated work, Flathead (Indian) project, fiscal year 1920.*

Principal features.	Sub-feature.	Principal feature.
Examination and surveys.....	.....	\$6,500
Storage system.....	.....	110,000
Canal system:		
Pablo feeder canal.....	\$50,000	
Pablo by-pass canal.....	20,000	
Camas A canal.....	4,000	
		74,000
Lateral system:		
Jocko division.....	22,000	
Mission division.....	63,500	
Pablo division.....	5,000	
Camas division.....	20,000	
Post division.....	3,000	
		113,500
Drainage system.....	.....	500
Irrigable lands.....	.....	5,000
Telephone system.....	.....	500
Operation and maintenance during construction.....	.....	60,000
Reimbursable accounts.....	.....	5,000
Total.....		375,000

MONTANA, FORT PECK (INDIAN) PROJECT.

R. M. CONNER, project manager, Poplar, Mont.

LOCATION.

Counties: Roosevelt, Sheridan, Valley.

Townships: 26 to 33 N., Rs. 39 to 56 E., Montana meridian.

Railroad: Great Northern.

Railroad stations and estimated population June 30, 1919: Wiota;¹ Kintyre;¹ Oswego, 350; Lohmiller;¹ Wolf Point, 2,600; Chelsea;¹ Poplar, 1,600; Sprole;¹ Brockton, 300; Calais;¹ and Blair.¹

WATER SUPPLY.

Source of supply: Missouri and Poplar Rivers; Little Porcupine, Big Porcupine, Wolf, Smoke, and Big Muddy Creeks.

Area of drainage basins: Missouri River, 85,000 square miles; Poplar River, 3,000 square miles; Big Porcupine Creek, 683 square miles.

Annual run-off in acre-feet (1909-1918): Poplar River, mean, 104,000; Big Porcupine Creek, mean, 22,100; Little Porcupine Creek, mean, 5,800; Big Muddy Creek, mean, 41,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which service is prepared to supply water, season of 1919: Little Porcupine unit, 2,330 acres; Poplar River unit, 10,290 acres; Big Porcupine unit, 4,000 acres.

Area irrigated, season of 1919: 738 acres to June 30, 1919.

Length of irrigating season: From April 1 to August 31, 153 days.

Average elevation of irrigable area: 2,000 feet above sea level.

Rainfall on irrigable area: 1886 to 1918, average, 13.50 inches; 1918, 13.02 inches.

Range of temperature on irrigable area: -40° to 100° F.

Character of soil of irrigable area: Heavy clay and loam.

Principal crops: Hay, grain, and vegetables.

Principal markets: Local and Minneapolis and St. Paul.

LAND OPEN FOR IRRIGATION.

In the construction of the system laterals are being constructed to the allotted area only. The work of allotting has been completed, but a few changes are being made. The allotted area in each unit is as follows: Big Porcupine, 6,400 acres; Little Porcupine, 2,330 acres; Missouri River, 38,000 acres; Poplar River, 11,600 acres; Big Muddy, 12,900 acres. Over 600 acres of allotted Indian land have been sold to white settlers. The unallotted area on the reservation is not open for settlement.

CHRONOLOGICAL SUMMARY.

Reconnaissance and preliminary surveys made in 1908.

Little Porcupine unit completed to allotted irrigable area in July, 1911.

Poplar River unit completed to allotted irrigable area of 7,890 acres in 1916.

Big Porcupine unit completed to 4,000 acres of allotted land, June, 1917.

Entire project 11.7 per cent completed June 30, 1919.

IRRIGATION PLAN.

The irrigation plan for the Fort Peck project provides, in so far as the water supply is found sufficient, for the irrigation of lands in various parts of the Fort Peck Indian Reservation and adjacent territory as follows: (1) 4,000 acres in the vicinity of Wiota station, with flood waters from Big Porcupine Creek; (2) 2,000 acres in the vicinity of Frazer, with water supply from Little Porcupine Creek conserved by storage; (3) 28,000 acres in the vicinity of Poplar and extending along Poplar River a distance of 35 miles, with water supply from Poplar River conserved by storage below the forks of Poplar and West Branch; (4) 16,000 acres lying along the west side of Big Muddy Creek, with water supply from Big Muddy Creek conserved by storage on Smoke and Wolf Creeks; (5) 50,000 acres of clear bench land and approximately 34,000 acres of brush and timber land extending along the Missouri River, with water supply from

¹ Population less than 25.

the Missouri River by a gravity canal heading near the site of old Fort Peck; (6) 10,000 acres, known as the Galpin Bottom, lying above the Missouri River Canal west of Milk River and Fort Peck Indian Reservation, with water supply by pumping from the Missouri River Canal, with a lift of about 20 feet; (7) 8,000 acres lying above the Missouri River Canal, east of Milk River, in the Fort Peck Indian Reservation, with water supply from pumping from the Missouri River Canal, with a lift of from 10 to 20 feet. The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

The Little Porcupine unit, with storage reservoir of 3,900 acre-feet capacity, has been completed to irrigate 2,330 acres. Poplar River west canal B has been completed to irrigate 2,560 acres of allotted area, Poplar River east canal C to irrigate 5,330 acres of allotted land, and Poplar River D canal to irrigate 2,400 acres. The Big Porcupine unit to irrigate 4,000 acres of allotted land on the west boundary of the reservation, with a reservoir of 3,800 acre-feet capacity on the Middle Fork, has been completed. Work on the Big Muddy Creek canals was begun in the latter part of the year.

During the fiscal year 1920 work will be continued on the Big Muddy unit to complete the first unit to furnish water to 4,000 acres of allotted Indian land. Little Porcupine storage reservoir will be improved by protecting the embankments with concrete paving. Future work will include the construction of storage works on Poplar River and extension of Poplar River canals, and the construction of storage at Medicine Lake for the Big Muddy; unit also the construction of the Missouri River Canal to irrigate 37,900 acres of allotted land along the Missouri River and adjacent to the Great Northern Railway, where the larger percentage of the Indians have their homes.

SUMMARY OF GENERAL DATA FOR FORT PECK (INDIAN) PROJECT TO END OF FISCAL YEAR 1919.

Areas:

Irrigable acreage when project is complete.....	152,000
Public land entered to June 30, 1919.....	9,713
Public land open to entry on June 30, 1919.....	107
State land unsold June 30, 1919.....	80
Indian land June 30, 1919.....	141,360
Private land June 30, 1919.....	740
<hr/>	
Acreage service could have supplied in season of 1918.....	16,620
Estimated acreage service can supply in season 1919.....	16,620
Estimated acreage service can supply in season 1920.....	20,620
Acreage irrigated season of 1918.....	1,299
Acreage cropped under irrigation season of 1918.....	958
Acreage dry farmed season of 1918.....	1,910

Crops:

Value of irrigated crops season of 1918.....	\$24,284.00
Value of irrigated crops per acre cropped.....	25.35

Finances:

Net construction cost to June 30, 1919.....	\$703,052.75
Per cent completed on June 30, 1919.....	11.7
Appropriated for fiscal year, 1920.....	\$100,000.00
Estimated per cent complete by June 30, 1920.....	13.7
Proposed appropriation for fiscal year, 1921.....	\$100,000.00
Estimated per cent complete by June 30, 1921.....	15.7
<hr/>	
Appropriation fiscal year 1919.....	\$50,000.00
Increased compensation.....	1,083.06
Increase miscellaneous collections.....	2,710.14
Unexpended balance.....	33,593.11
	<hr/>
	87,386.31

Expenditures chargeable to 1919 appropriation:

Disbursements.....	54,274.57
Increased compensation.....	1,083.06
Current liabilities.....	8,764.83
	<hr/>
	64,022.46

Unencumbered balance on July 1, 1919.....	28,363.85
---	-----------

CONSTRUCTION DURING FISCAL YEAR.

Construction during the fiscal year 1919 consisted of the excavation of the main canal on the first division of the Big Muddy unit to irrigate 4,000 acres of allotted Indian land, and the partial construction of the diversion dam for this unit.

SEEPAGE AND DRAINAGE.

None of the project lands became damaged by seepage during the year, and no drainage work was necessary.

OPERATION AND MAINTENANCE.

Water was available under the Little Porcupine unit and both canals of the Poplar River unit. Owing to the exceptionally dry year, only a small amount of water was available under the Poplar River unit. A total of 1,299 acres were irrigated.

The precipitation during 1918 was 13.02 inches; 9.09 inches of this occurred after July 15. This was too late to be of much benefit to crops, and the water supply for irrigation was small. During the first six months of 1919 the precipitation was 3.50 inches, and dry-land crops have suffered. During the first half of this year there has been sufficient water available under Little Porcupine unit from storage, but the flow of Poplar River and Big Porcupine has been too small to furnish water to all the lands under water-rental contract.

Historical review, Fort Peck project.

Item.	1914	1915	1916	1917	1918	1919
Acreage for which service was prepared to supply water	10, 220	12, 620	12, 620	14, 220	16, 620	16, 620
Acreage irrigated.....	1, 004	1, 100	1, 092	1, 602	1, 299	¹ 1, 200
Miles of canals operated.....	85	85	85	126	158	158
Water diverted (acre-feet).....	2, 000	3, 000	3, 500	3, 600	3, 000	¹ 3, 000
Water delivered to land (acre-feet).....	2, 000	1, 560	2, 250	1, 550	1, 400	¹ 2, 000
Per acre of land irrigated (acre-feet).....	2.0	1.42	1.6	1.2	1.08	¹ 1.6

¹ Estimated.

SETTLEMENT.

In the spring of 1914 the unallotted grazing land on the reservation was opened to entry through a drawing in September, 1913. The settlement of this land was relatively slow during 1914 and 1915, but during the spring of 1916 a large number of entries were made, the desirable land being well taken up. In the spring of 1917, about 220,000 acres of unallotted land, previously withheld as mineral, were authorized to be appraised and opened for entry. Some of the Indians have received title to their land and a number of irrigable allotments have changed hands at prices ranging from \$30 to \$40 per acre. On the Poplar River unit, some of the Indians are moving onto their allotments and establishing homes.

Settlement data, Fort Peck project.

Item.	1915	1916	1917	1918	1919
Total number of allotments on project (irrigable).....	1,780	1,780	1,780	1,780	1,780
Population (Indian).....	2,046	2,092	2,180	2,160	2,157
Number of irrigated farms.....	42	48	58	66	170
Operated by owners or managers.....	40	46	57	60	119
Operated by tenants.....	2	2	1	6	11
Population.....	110	130	134	130	1150
Number of towns.....	5	5	5	5	5
Population (white).....	1,780	2,200	2,680	13,500	14,800
Total population in towns and on farms.....	3,826	4,292	4,780	5,660	.....
Number of schools:					
Indian.....	5	5	5	5	4
White.....	2	5	5	5	5
Number of churches.....	7	7	8	9	10
Number of banks.....	5	4	6	9	9
Total capital stock.....	\$105,000	\$110,000	\$130,000	\$185,000	\$225,000
Amount of deposits.....	\$234,000	\$477,000	\$580,000	\$1,095,000	\$1,555,000
Number of depositors.....	1,400	1,970	2,630	3,700	14,800

¹ Estimated.**PRINCIPAL CROPS.**

The principal crops are oats, wheat, flax, vegetables, and blue-joint hay. Some of the Indians are turning their attention to alfalfa and several have sown small acreages on their irrigable allotments. Increased areas are farmed each year under both irrigation and dry farming. The greater number of the Indians have their homes along the Missouri River on land not yet under irrigation, and on which most of their farming is done. With favorable weather conditions good crops can be raised on this area by dry-farming methods, but results for the past three years have been rather disappointing, so that most of the Indians have been turning their attention to the irrigable land on Little Porcupine and Poplar River units.

Crop report, Fort Peck (Indian) project, Montana, year of 1918.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	42	Ton.....	79	1.9	\$20.00	\$1,580	\$37.62
Flax.....	121	Bushel.....	1,196	9.9	3.30	3,947	32.62
Hay, blue joint.....	524	Ton.....	421	.8	20.00	8,420	16.07
Oats.....	64	Bushel.....	1,950	30.5	.70	1,365	21.33
Wheat.....	163	do.....	2,892	17.7	1.99	5,755	35.31
Potatoes.....	23	do.....	1,870	81.3	.75	1,402	60.98
Garden.....	21	.....	.....	.....	.....	1,815	86.43
Total cropped acreage.....	958	Total and average.....	.....	.....	.....	24,284	25.35
Irrigated, no crop.....	341	.....	.....	.....	.....	.....	.....
Total irrigated acreage.....	1,299	.....	.....	.....	.....	.....	.....

FINANCIAL STATEMENT.

Condensed balance sheet, Fort Peck (Indian) project, June 30, 1919.

Cash.....	\$18.85
Inventory of materials and supplies.....	14,655.19
Accounts receivable.....	362.55
Gross construction cost.....	\$704,534.21
Less construction revenue earnings.....	1,481.46
Net construction cost.....	703,052.75
Accounts payable.....	8,764.83
Contingent obligations.....	4.00
Capital investment:	
Disbursement, transfer, and joint construction vouchers received.....	714,092.09
Collection, transfer, refund, and joint construction vouchers issued.....	4,771.58
Net investment.....	709,320.51

Feature costs of Fort Peck (Indian) project.

Features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys:		
Missouri River Canal.....		\$31,421.00
Project as a whole (stream gauging).....	\$726.48	2,512.73
Big Muddy unit.....		118.10
Poplar River unit.....	70.68	3,261.37
	797.16	37,313.19
Storage system:		
Big Porcupine dam and spillway.....	1 700.47	99,607.90
Little Porcupine Reservoir.....	392.10	30,055.19
Poplar River Reservoir.....	1,941.90	3,769.26
	1,633.53	133,432.35
Canal system:		
Poplar River unit.....	3,519.48	210,465.36
Big Porcupine unit.....	488.86	64,487.87
Big Muddy unit.....	33,700.52	48,462.00
	37,708.86	318,415.23
Lateral system:		
Little Porcupine unit.....	365.69	24,576.17
Poplar River unit.....	2,143.33	55,620.48
Big Porcupine unit.....	57.96	72,722.99
Big Muddy unit.....	8,105.11	8,575.78
	10,672.09	161,495.42
Permanent improvements:		
Oswego division.....	1 1,268.59	
Poplar River unit.....	1 5,474.14	
Big Porcupine unit.....	1 994.47	
	1 7,737.20	
Telephone system:		
Big Porcupine unit.....	52.39	1,048.47
Poplar River unit.....	260.36	260.36
	312.75	1,308.83
Operation and maintenance during construction (water-rental basis).....	5,909.11	36,045.26
Total cost of construction features.....	49,296.30	688,010.28
Balance in plant accounts.....		13,672.66
Unadjusted clearing accounts.....		2,851.27
Gross construction cost to June 30, 1919.....	49,296.30	704,534.21
Less revenues earned during construction period:		
Rentals of buildings.....	1 404.71	
Rentals of grazing and farming lands.....	162.50	162.60
Rentals of irrigation water.....	973.50	973.50
Other revenues, unclassified.....	1 1,540.85	
Gain on operations, unclassified.....	740.49	345.46
Total.....	1 69.07	1,481.46
Net construction cost to June 30, 1919.....	49,365.37	703,052.75

¹ Deduct.

454 EIGHTEENTH ANNUAL REPORT OF RECLAMATION SERVICE.

Statement of cost by calendar years, Fort Peck (Indian) project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending Dec. 31—			
1908.....	\$7,019.16		\$7,019.16
1909.....	22,821.37		22,821.37
1910.....	85,382.50		85,382.50
1911.....	70,127.23		70,127.23
1912.....	17,110.85	\$323.07	17,433.92
1913.....	117,299.74	2,410.22	119,709.96
1914.....	104,293.99	5,863.03	110,157.02
1915.....	26,645.61	2,113.23	28,758.84
1916.....	31,623.33	5,501.69	37,125.02
1917.....	86,344.04	11,533.34	97,877.38
1918.....	61,783.97	4,973.67	66,757.64
June 30, 1919.....	11,513.23	2,827.01	14,340.24
Subtotal.....	651,965.02	36,045.26	688,010.28
Plant accounts.....			13,672.66
Unadjusted clearing accounts.....			2,851.27
Total.....	651,965.02	36,045.26	704,534.21

Statement of cost by fiscal years, Fort Peck (Indian) project.

	Construction.	Operation and maintenance during construction.	Total cost.
Year ending June 30—			
1909.....	\$12,548.37		\$12,548.37
1910.....	50,705.86		50,705.86
1911.....	117,180.84		117,180.84
1912.....	16,466.80	\$188.89	16,655.69
1913.....	73,892.56	1,775.86	75,668.43
1914.....	109,713.74	3,984.23	113,698.02
1915.....	58,999.93	3,723.77	62,723.70
1916.....	31,200.90	4,911.75	36,112.65
1917.....	52,525.22	8,682.68	61,207.90
1918.....	85,343.61	6,868.92	92,212.53
1919.....	43,387.19	5,909.11	49,296.30
Subtotal.....	651,965.02	36,045.26	688,010.28
Plant accounts.....			13,672.66
Unadjusted clearing accounts.....			2,851.27
Total.....	651,965.02	36,045.26	704,534.21

Estimated cost of contemplated work, Fort Peck (Indian) project, during fiscal year 1920.

Principal features.	Subfeature.	Principal feature.
Examination and surveys: Stream gaging.....		\$500.00
Storage works:		
Poplar River.....	\$31,900.00	
Little Porcupine.....	14,000.00	
		36,500.00
Canal system: Big Muddy unit.....		17,700.00
Lateral system: Big Muddy unit.....		38,200.00
Drainage system: Big Muddy unit.....		7,900.00
Telephones:		
Poplar River unit.....	1,300.00	
Big Muddy unit.....	500.00	
		1,800.00
Operation and maintenance during construction (water-rental basis).....		10,000.00
Total.....		122,000.00

WYOMING, RIVERTON (INDIAN) PROJECT.

H. D. Comstock, project manager, Riverton, Wyo.

LOCATION.

County: Fremont.

Townships: 1 to 4 N., Rs. 2 W. to 6 E., Wind River meridian.

Railroad: Chicago & Northwestern.

Railroad station and estimated population June 30, 1919: Riverton, 2,000; and Shoshoni, 500.

WATER SUPPLY.

Source of water supply: Wind River.

Area of drainage basin: About 1,800 square miles.

Annual run-off in acre-feet: Wind River at Riverton, Wyo. (2,320 square miles), 1906, 1908, and 1911 to 1918, inclusive, maximum 1,127,000, minimum 685,000.

AGRICULTURAL AND CLIMATIC CONDITIONS.

Area for which the service is prepared to supply water, season of 1919: None.

Area under water-right applications and rental contracts, season of 1919: None.

Length of irrigation season: May 1 to September 30, 153 days.

Average elevation of irrigable area: 5,200 feet above sea level.

Rainfall on irrigable area: about 8 inches (no direct record).

Range of temperature on irrigable area: -30° to 102° F.

Character of soil of irrigable area: Sandy loam to heavy clay.

Principal products: Alfalfa, cereals, sugar beets and potatoes.

Principal markets: Omaha, Denver, and local.

LANDS OPENED FOR IRRIGATION.

No lands have been opened.

Duty of water: $2\frac{1}{2}$ acre-feet per acre per annum at the farm.

CHRONOLOGICAL SUMMARY.

Reconnaissance made in 1904.

Examination made August and November, 1916.

Investigation made July to October, 1917.

Surveys preparatory to construction begun August 1, 1918.

IRRIGATION PLAN.

The irrigation plan of the Riverton project provides for the storage of the flood waters of Bull Lake and Dinwoodie Creeks, tributaries of Wind River, in Bull Lake and Dinwoodie Lake reservoirs, respectively, and the diversion of water from Wind River by a dam about 15 miles above Pilot, Wyo., into the Wyoming Canal, for the irrigation of lands lying northeast of Wind River, west of the Big Horn River, and south of Cottonwood Creek. The flood waters of Wind River will be stored in Pilot Butte reservoir, about 10 miles below the head of the Wyoming Canal.

The United States claims all waste, seepage, spring, and percolating water arising within the project and proposes to use such water in connection therewith.

None of the features of the project have yet been completed.

SUMMARY OF GENERAL DATA FOR RIVERTON PROJECT TO END OF FISCAL YEAR 1919.

Areas:	
Irrigable acreage when project is complete.....	100, 000
Public land withdrawn on June 30, 1919.....	69, 000
Indian land June 30, 1919.....	1, 000
Private land June 30, 1919.....	30, 000
Finances:	
Net construction cost to June 30, 1919.....	\$72, 456. 08
Appropriated for fiscal year 1920.....	\$200, 000. 00
Estimated per cent complete by June 30, 1920.....	4. 4
Proposed appropriation for fiscal year 1921.....	1, 350, 000. 00
Estimated per cent complete by June 30, 1921.....	23
Appropriation fiscal year 1919.....	\$100, 000. 00
Increased compensation.....	2, 354. 69
	102, 354. 69
Expenditures chargeable to 1919 appropriation:	
Disbursements.....	\$49, 725. 97
Increased compensation.....	2, 354. 69
Current liabilities.....	13, 663. 75
Contingent liabilities.....	3, 056. 90
	68, 801. 31
Unencumbered balance on July 1, 1919.....	33, 553. 38

CONSTRUCTION DURING FISCAL YEAR.

No actual construction was undertaken during the fiscal year.

A topographic survey of the project on a scale of 1 inch equals 400 feet, with 2-foot contour interval, was begun and was about 50 per cent completed on June 30, 1919.

A thorough investigation of the Bull Lake reservoir site was made.

An investigation of the Wind River diversion dam site was also made and data collected preparatory to the location and design of the dam.

A location of the first 10 miles of the Wyoming Canal was made.

SETTLEMENT.

Settlement data, Riverton project.

Item.	1919
Number of towns.....	2
Population.....	¹ 2, 500
Number of public schools.....	2
Number of churches.....	7
Number of banks.....	5
Total capital stock.....	\$110, 000
Amount of deposits.....	¹ \$1, 200, 000
Number of depositors.....	¹ 2, 700

¹ Estimated.

PRINCIPAL CROPS.

No part of the project was under cultivation in either 1918 or 1919.

FINANCIAL STATEMENT.

Project balance sheet, Riverton (Indian) project, June 30, 1919.

Cash.....	\$150.00
Inventory of stock on hand.....	1,047.01
Accounts receivable.....	78.66
Construction work contracted.....	2,906.90
Gross construction cost.....	\$71,917.63
Less construction revenue earnings.....	¹ 538.45
Net construction cost.....	72,456.08
Accounts payable.....	13,663.75
Contingent obligations.....	3,056.90
Capital investments:	
Disbursements, transfers, and joint construction vouchers received.....	60,022.98
Collection, transfer, and joint construction vouchers issued.....	104.98
Net investment.....	59,918.00

¹ Contra entry.

Feature costs of Riverton (Indian) project.

Principal features.	Fiscal year 1919.	Total to June 30, 1919.
Examination and surveys.....	\$27,571.82	\$35,638.10
Storage system, Bull Lake Reservoir.....	5,966.44	5,966.44
Canal system:		
Diversion dam surveys.....	10,919.30	10,919.30
Wyoming Canal surveys.....	6,265.15	6,265.15
Total canal system.....	17,184.45	17,184.45
Permanent improvements and lands, lots, Riverton, for residences.....	1,356.50	1,356.50
Total cost of construction features.....	52,079.21	60,145.49
Plant accounts.....		12,133.17
Unadjusted clearing accounts.....		¹ 361.03
Gross construction cost.....	52,079.21	71,917.63
Less revenues earned during construction period:		
Rental of buildings.....	5.00	5.00
Hospital.....	¹ 538.55	¹ 543.45
Total revenues.....	¹ 563.55	¹ 538.45
Net construction cost.....	52,642.76	72,456.08

¹ Deduct.

Statement of costs by calendar years, Riverton (Indian) project.

	Total cost.
Year ending Dec. 31—	
1917.....	\$2,554.80
1918.....	18,881.82
1919, Jan. 1 to June 30.....	38,708.87
Subtotal.....	60,145.49
Unadjusted clearing accounts.....	¹ 361.03
Plant accounts.....	12,133.17
Total.....	71,917.63

¹ Deduct.

Statement of costs by fiscal years, Riverton (Indian) project.

	Total cost.
Year ending June 30—	
1917.....	\$3,292.14
1918.....	5,774.14
1919.....	53,079.21
Subtotal.....	60,145.49
Unadjusted clearing accounts.....	1,361.08
Plant accounts.....	12,133.17
Total.....	71,917.63

¹ Deduct.*Estimated cost of contemplated work, Riverton project, during fiscal year 1920.*

Principal feature.	Estimated cost.
Examination and surveys: Topographic surveys and hydrographic investigations.....	\$20,000
Storage system: Exploration of dam sites, Bull Lake and Pilot Butte.....	1,000
Canal system: Continuation of main canal location and beginning of construction.....	152,000
Permanent improvements: Construction of warehouse at Riverton and cottage at diversion dam.....	5,000
Telephone system: Telephone line from Riverton to the diversion dam, about 50 miles.....	20,000
Reimbursable accounts.....	2,000
Total.....	200,000

APPENDIX.

LEGISLATION.

THE NATIONAL IRRIGATION ACT.

An act appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands. (Act of June 17, 1902, ch. 1093, 32 Stat., 388.)

Sec. 1. [Reclamation fund established from public-land receipts—Exception—Support of agricultural colleges—Deficiency.] That all moneys received from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming, beginning with the fiscal year ending June 30, 1901, including the surplus of fees and commissions in excess of allowances to registers and receivers, and excepting the 5 per centum of the proceeds of the sales of public lands in the above States set aside by law for educational and other purposes, shall be, and the same are hereby, reserved, set aside, and appropriated as a special fund in the Treasury to be known as the reclamation fund, to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion, and development of waters for the reclamation of arid and semiarid lands in the said States and Territories, and for the payment of all other expenditures provided for in this act: *Provided*, That in case the receipts from the sale and disposal of public lands other than those realized from the sale and disposal of lands referred to in this section are insufficient to meet the requirements for the support of agricultural colleges in the several States and Territories, under the act of August 30, 1890, entitled "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts, established under the provisions of an act of Congress approved July 2, 1862," the deficiency, if any, in the sum necessary for the support of the said colleges shall be provided for from any moneys in the Treasury not otherwise appropriated. [32 Stat., 388.]

Sec. 2. [Authority to locate and construct irrigation works—Report to Congress.] That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion, and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, giving estimates of cost of all contemplated works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction, as well as of those which have been completed. [32 Stat., 388.]

Sec. 3. [Withdrawal of lands for irrigation works—Withdrawal of lands susceptible of irrigation—Homestead entries—Determination whether project is practicable—Restoration and entry—Commutation.] That the Secretary of the Interior shall, before giving the public notice provided for in section 4 of this act, withdraw from public entry the lands required for any irrigation works contemplated under the provisions of this act, and shall restore to public entry any of the lands so withdrawn when, in his judgment, such lands are not required for the purposes of this act; and the Secretary of the Interior is hereby authorized, at or immediately prior to the time of beginning the surveys for any contemplated irrigation works, to withdraw from entry, except under the homestead laws, any public lands believed to be susceptible of irrigation from said works: *Provided*, That all lands entered and entries made under the homestead laws within areas so withdrawn during such withdrawal shall be subject to all the provisions, limitations, charges, terms, and conditions of this act; that said surveys shall be prosecuted diligently to completion, and upon the completion thereof and of the necessary maps, plans, and estimates of cost the Secretary of the Interior shall determine whether or not said project is practicable and advisable, and if determined to be impracticable or inadvisable he shall thereupon restore said lands to entry; that public lands which it is proposed to irrigate by means of any contemplated works shall be subject to entry only under the provisions of the homestead laws in tracts of not less than forty nor more than one hundred and sixty acres, and shall be subject to the limitations, charges, terms, and conditions herein provided: *Provided*, That the commutation provisions of the homestead laws shall not apply to entries made under this act. [32 Stat., 388.]

Sec. 4. [Contracts for construction—Public notice of irrigable lands, limit of area, charges per acre, and method of payment—Limit of work hours—Mongolian labor.] That upon the determination by the Secretary of the Interior that any irrigation project is practicable, he may cause to be let contracts for the construction of the same, in such portions or sections as it may be practicable to construct and complete as parts of the whole project, providing the necessary funds for such portions or sections are available in the reclamation fund, and thereupon he shall give public notice of the lands irrigable under such project, and limit of area per entry, which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question; also of the charges which shall be made per acre upon the said entries, and upon lands in private ownership which may be irrigated by the waters of the said irrigation project, and the number of annual installments, not exceeding ten, in which such charges shall be paid and the time when such payments shall commence. The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project, and shall be apportioned equitably: *Provided*, That in all construction work eight hours shall constitute a day's work, and no Mongolian labor shall be employed thereon. [32 Stat., 389.]

Sec. 5. [Requirements of entrymen—Limit of 160 acres—Residence—Payments—Disposal of receipts—Commissions.] That the entryman upon lands to be irrigated by such works shall, in addition

to compliance with the homestead laws, reclaim at least one-half of the total irrigable area of his entry for agricultural purposes, and before receiving patent for the lands covered by his entry shall pay to the Government the charges apportioned against such tract, as provided in section four. No right to the use of water for land in private ownership shall be sold for a tract exceeding one hundred and sixty acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefor are made. The annual installments shall be paid to the receiver of the local land office of the district in which the land is situated, and a failure to make any two payments when due shall render the entry subject to cancellation, with the forfeiture of all rights under this act, as well as of any moneys already paid thereon. All moneys received from the above sources shall be paid into the reclamation fund. Registers and receivers shall be allowed the usual commissions on all moneys paid for lands entered under this act. [32 Stat., 389.]

Sec. 6. [Reclamation fund to be used for operation and maintenance—Management of works to pass to landowners—Title.] That the Secretary of the Interior is hereby authorized and directed to use the reclamation fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provisions of this act: *Provided*, That when the payments required by this act are made for the major portion of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense under such form of organization and under such rules and regulations as may be acceptable to the Secretary of the Interior: *Provided*, That the title to and the management and operation of the reservoirs and the works necessary for their protection and operation shall remain in the Government until otherwise provided by Congress. [32 Stat., 389.]

Sec. 7. [Authority to acquire property—Attorney General to institute condemnation proceedings.] That where in carrying out the provisions of this act it becomes necessary to acquire any rights or property, the Secretary of the Interior is hereby authorized to acquire the same for the United States by purchase or by condemnation under judicial process, and to pay from the reclamation fund the sums which may be needed for that purpose, and it shall be the duty of the Attorney General of the United States upon every application of the Secretary of the Interior, under this act, to cause proceedings to be commenced for condemnation within thirty days from the receipt of the application at the Department of Justice. [32 Stat., 389.]

Sec. 8. [Irrigation laws of States and Territories not affected—Interstate streams—Water rights.] That nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right

of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof: *Provided*, That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated and beneficial use shall be the basis, the measure, and the limit of the right. [32 Stat., 390.]

Sec. 9. [Repealed by section 6, act of June 25, 1910, 36 Stat., 835.]

Sec. 10. [Authority to make rules and regulations.] That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect. [32 Stat., 390.]

THE EXTENSION ACT.

An act extending the period of payment under reclamation projects, and for other purposes. (Act Aug. 13, 1914, ch. 247, 38 Stat., 686.)

Sec. 1. [Payments of construction charges under future rights—Entry before charge is established.] That any person whose lands hereafter become subject to the terms and conditions of the act approved June 17, 1902, entitled "An act appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands," and acts amendatory thereof or supplementary thereto, hereafter to be referred to as the reclamation law, and any person who hereafter makes entry thereunder shall at the time of making water-right application or entry, as the case may be, pay into the reclamation fund 5 per centum of the construction charge fixed for his land as an initial installment, and shall pay the balance of said charge in fifteen annual installments, the first five of which shall each be 5 per centum of the construction charge and the remainder shall each be 7 per centum until the whole amount shall have been paid. The first of the annual installments shall become due and payable on December 1 of the fifth calendar year after the initial installment: *Provided*, That any water-right applicant or entryman may, if he so elects, pay the whole or any part of the construction charges owing by him within any shorter period: *Provided further*, That entry may be made whenever water is available, as announced by the Secretary of the Interior, and the initial payment be made when the charge per acre is established. [38 Stat., 686.]

Sec. 2. [Payments of construction charges under existing rights.] That any person whose land or entry has heretofore become subject to the terms and conditions of the reclamation law shall pay the construction charge, or the portion of the construction charge remaining unpaid, in twenty annual installments, the first of which shall become due and payable on December 1 of the year in which the public notice affecting his land is issued under this act, and subsequent installments on December 1 of each year thereafter. The first four of such installments shall each be 2 per centum, the next two installments shall each be 4 per centum, and the next fourteen each 6 per centum of the total construction charge, or the portion of the construction charge unpaid at the beginning of such installments. [38 Stats., 687.]

Sec. 3. [Penalties for nonpayment of construction charges—Cancellation and forfeiture—Actions for recovery.] That if any water-right applicant or entryman shall fail to pay any installment of his construction charges when due, there shall be added to the amount unpaid a penalty of 1 per centum thereof, and there shall be added a like penalty of 1 per centum of the amount unpaid on the first day of each month thereafter so long as such default shall continue. If any such applicant or entryman shall be one year in default in the payment of any installment of the construction charges and penalties, or any part thereof, his water-right application, and if he be a homestead entryman his entry also, shall be subject to cancellation, and all payments made by him forfeited to the reclamation fund, but no homestead entry shall be subject to contest because of such default: *Provided*, That if the Secretary of the Interior shall so elect, he may cause suit or action to be brought for the recovery of the amount in default and penalties; but if suit or action be brought, the right to declare a cancellation and forfeiture shall be suspended pending such suit or action. [38 Stat., 687.]

Sec. 4. [Restriction on increasing construction charges—Time for paying increase—Charges subject to certain conditions.] That no increase in the construction charges shall hereafter be made, after the same have been fixed by public notice, except by agreement between the Secretary of the Interior and a majority of the water-right applicants and entrymen to be affected by such increase, whereupon all water-right applicants and entrymen in the area proposed to be affected by the increased charge shall become subject thereto. Such increased charge shall be added to the construction charge and payment thereof distributed over the remaining unpaid installments of construction charges: *Provided*, That the Secretary of the Interior, in his discretion, may agree that such increased construction charge shall be paid in additional annual installments, each of which shall be at least equal to the amount of the largest installment as fixed for the project by the public notice theretofore issued. And such additional installments of the increased construction charge, as so agreed upon, shall become due and payable on December 1 of each year subsequent to the year when the final installment of the construction charge under such public notice is due and payable: *Provided further*, That all such increased construction charges shall be subject to the same conditions, penalties, and suit or action as provided in section three of this act. [38 Stat., 687.]

Sec. 5. [Operation and maintenance charges—Basis therefor—Minimum charge—Secretary may transfer care and operation of project—Reduction or increase of charges.] That in addition to the construction charge, every water-right applicant, entryman, or landowner under or upon a reclamation project shall also pay, whenever water service is available for the irrigation of his land, an operation and maintenance charge based upon the total cost of operation and maintenance of the project, or each separate unit thereof, and such charge shall be made for each acre-foot of water delivered; but each acre of irrigable land, whether irrigated or not, shall be charged with a minimum operation and maintenance charge based upon the charge for delivery of not less than one acre-foot of water: *Provided*, That whenever any legally organized water users' association or irrigation district shall so request, the Secretary of the Interior is hereby

authorized in his discretion, to transfer to such water users' association or irrigation district the care, operation, and maintenance of all or any part of the project works, subject to such rules and regulations as he may prescribe. If the total amount of operation and maintenance charges and penalties collected for any one irrigation season on any project shall exceed the cost of operation and maintenance of the project during that irrigation season, the balance shall be applied to a reduction of the charge on the project for the next irrigation season, and any deficit incurred may likewise be added to the charge for the next irrigation season. [38 Stat., 687.]

Sec. 6. [Date when charges become due fixed by the Secretary—Discount for prompt payment—Penalty for nonpayment—Cancellation for continued arrears—Actions for recovery.] That all operation and maintenance charges shall become due and payable on the date fixed for each project by the Secretary of the Interior, and if such charge is paid on or before the date when due there shall be a discount of 5 per centum of such charge; but if such charge is unpaid on the first day of the third calendar month thereafter, a penalty of 1 per centum of the amount unpaid shall be added thereto, and thereafter an additional penalty of 1 per centum of the amount unpaid shall be added on the first day of each calendar month if such charge and penalties shall remain unpaid, and no water shall be delivered to the lands of any water-right applicant or entryman who shall be in arrears for more than one calendar year for the payment of any charge for operation and maintenance or any annual construction charge and penalties. If any water-right applicant or entryman shall be one year in arrears in the payment of any charge for operation and maintenance and penalties, or any part thereof, his water-right application, and if he be a homestead entryman his entry also, shall be subject to cancellation, and all payments made by him forfeited to the reclamation fund, but no homestead entry shall be subject to contest because of such arrears. In the discretion of the Secretary of the Interior suit or action may be brought for the amounts in default and penalties in like manner as provided in section three of this act. [38 Stat., 688.]

Sec. 7. [Local association may be appointed fiscal agent for the United States to collect charges—Official receipt.] That the Secretary of the Interior is hereby authorized, in his discretion, to designate and appoint, under such rules and regulations as he may prescribe, the legally organized water users' association or irrigation district, under any reclamation project, as the fiscal agent of the United States to collect the annual payments on the construction charge of the project and the annual charges for operation and maintenance and all penalties: *Provided*, That no water-right applicant or entryman shall be entitled to credit for any payment thus made until the same shall have been paid over to an officer designated by the Secretary of the Interior to receive the same. [38 Stat., 688.]

Sec. 8. [Authority to make regulations governing use of water, reclamation, and cultivation—Penalty for noncompliance with regulations.] That the Secretary of the Interior is hereby authorized to make general rules and regulations governing the use of water in the irrigation of the lands within any project, and may require the reclamation for agricultural purposes and the cultivation of one-fourth the irrigable area under each water-right application or entry

within three full irrigation seasons after the filing of water-right application or entry, and the reclamation for agricultural purposes and the cultivation of one-half the irrigable area within five full irrigation seasons after the filing of the water-right application or entry, and shall provide for continued compliance with such requirements. Failure on the part of any water-right applicant or entryman to comply with such requirements shall render his application or entry subject to cancellation. [38 Stat., 688.]

Sec. 9. [Additional construction charges for certain lands.] That in all cases where application for water-right for lands in private ownership or lands held under entries not subject to the reclamation law shall not be made within one year after the passage of this act, or within one year after notice issued in pursuance of section 4 of the reclamation act, in cases where such notice has not heretofore been issued, the construction charges for such land shall be increased 5 per centum each year until such application is made and an initial installment is paid. [38 Stat., 689.]

Sec. 10. [Entries prior to June 25, 1910—Disposal of relinquished lands.] That the act of Congress approved February 18, 1911, entitled "An act to amend section 5 of the act of Congress of June 25, 1910, entitled 'An act to authorize advances to the reclamation fund and for the issuance and disposal of certificates of indebtedness in reimbursement therefor, and for other purposes,'" be, and the same hereby is, amended so as to read as follows:

"Sec. 5. That no entry shall be hereafter made and no entryman shall be permitted to go upon lands reserved for irrigation purposes until the Secretary of the Interior shall have established the unit of acreage per entry, and water is ready to be delivered for the land in such unit or some part thereof and such fact has been announced by the Secretary of the Interior: *Provided*, That where entries made prior to June 25, 1910, have been or may be relinquished, in whole or in part, the lands so relinquished shall be subject to settlement and entry under the reclamation law." [38 Stat., 689.]

Sec. 11. [Furnishing water before regular rates are fixed.] That whenever water is available and it is impracticable to apportion operation and maintenance charges as provided in section 5 of this act, the Secretary of the Interior may, prior to giving public notice of the construction charge per acre upon land under any project, furnish water to any entryman or private landowner thereunder until such notice is given, making a reasonable charge therefor, and such charges shall be subject to the same penalties and to the provisions for cancellation and collection as herein provided for other operation and maintenance charges. [38 Stat., 689.]

Sec. 12. [Owners of private lands under new projects must dispose of excess area—Lands excluded upon refusal.] That before any contract is let or work begun for the construction of any reclamation project hereafter adopted the Secretary of the Interior shall require the owners of private lands thereunder to agree to dispose of all lands in excess of the area which he shall deem sufficient for the support of a family upon the land in question, upon such terms and at not to exceed such price as the Secretary of the Interior may designate; and if any landowner shall refuse to agree to the requirements fixed by the Secretary of the Interior, his land shall not be included within the projects if adopted for construction. [38 Stat., 689.]

Sec. 13. [Entries to be reduced to single farm units—Time for making proof—Cancellation of excess entries—Issue of patents—Assignments restricted.] That all entries under reclamation projects containing more than one farm unit shall be reduced in area and conformed to a single farm unit within two years after making proof of residence, improvement, and cultivation, or within two years after the issuance of a farm-unit plat for the project, if the same issues subsequent to the making of such proof: *Provided*, That such proof is made within four years from the date as announced by the Secretary of the Interior that water is available for delivery for the land. Any entryman failing within the period herein provided to dispose of the excess of his entry above one farm unit, in the manner provided by law, and to conform his entry to a single farm unit shall render his entry subject to cancellation as to the excess above one farm unit: *Provided*, That upon compliance with the provisions of law such entryman shall be entitled to receive a patent for that part of his entry which conforms to one farm unit as established for the project: *Provided further*, That no person shall hold by assignment more than one farm unit prior to final payment of all charges for all the land held by him subject to the reclamation law, except operation and maintenance charges not then due. [38 Stat., 690.]

Sec. 14. [Acceptance of extension of payments to be made within six months.] That any person whose land or entry has heretofore become subject to the reclamation law, who desires to secure the benefits of the extension of the period of payments provided by this act, shall, within six months after the issuance of the first public notice hereunder affecting his land or entry, notify the Secretary of the Interior, in the manner to be prescribed by said Secretary, of his acceptance of all of the terms and conditions of this act, and thereafter his lands or entry shall be subject to all of the provisions of this act. [38 Stat., 690.]

Sec. 15. [General authority.] That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect. [38 Stat., 690.]

Sec. 16. [Expenditures after July 1, 1915, limited to specific appropriations—To be paid out of reclamation fund.] That from and after July 1, 1915, expenditures shall not be made for carrying out the purposes of the reclamation law except out of appropriations made annually by Congress therefor, and the Secretary of the Interior shall, for the fiscal year 1916, and annually thereafter, in the regular Book of Estimates, submit to Congress estimates of the amount of money necessary to be expended for carrying out any or all of the purposes authorized by the reclamation law, including the extension and completion of existing projects and units thereof and the construction of new projects. The annual appropriations made hereunder by Congress for such purposes shall be paid out of the reclamation fund provided for by the reclamation law. [38 Stat., 690.]

DEFICIENCY APPROPRIATIONS.

An act making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1919, and prior fiscal years, and for other purposes. (Act of Feb. 25, 1919, Public, No. 275.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, to supply deficiencies in appropriations for the fiscal year ending June thirtieth, nineteen hundred and nineteen, and prior fiscal years, and for other purposes, namely:

* * * * *

DEPARTMENT OF INTERIOR.**RECLAMATION SERVICE.**

Lower Yellowstone project, Montana: For repairs to irrigation works, made necessary because of a cloudburst and flood on the lower Yellowstone project, near Savage, Mont., August 15 to 21, 1918, \$52,000, to be paid out of the reclamation fund.

For payment of accounts of the Reclamation Service, which have been disallowed by the Auditor for the Interior Department, in the amounts set forth in House Document No. 1620 of the present session, \$80.50.

* * * * *

LANDS FOR SCHOOL PURPOSES, SUN RIVER PROJECT.

An act granting lands for school purposes in lots No. 111 in each of the town sites of Fort Shaw and Simms, Sun River reclamation project, Montana. (Act of Feb. 28, 1919, Public, No. 305.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be hereby authorized and directed to issue patent conveying lot No. 111 in the town site of Fort Shaw, Sun River reclamation project, Montana, to school district No. 82, Cascade County, Mont., and also lot No. 111 in the town site of Simms, Sun River reclamation project, Montana, to school district No. 39, Cascade County, Mont.

LANDS FOR RESERVOIR SITES, SUN RIVER AND MILK RIVER PROJECTS.

An act to authorize an exchange of lands with the State of Montana in connection with Muddy Creek Reservoir site, Sun River project, and Nelson Reservoir site, Milk River project, and for other purposes. (Act of Feb. 28, 1919, Public, No. 304.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That upon receipt of proper deeds from the State Board of Land Commissioners of the State of Montana, executed under authority of its legislative assembly, re-conveying to the United States of America title to the northwest quarter of the northwest quarter section 2, north half of the northeast quarter and southeast quarter of the northeast quarter section 3, township 22 north, range 1 west, Montana principal meridian; northeast quarter of the northeast quarter, south half of the northeast

quarter, and southeast quarter section 20, east half of the northeast quarter, and southeast quarter section 21, southwest quarter of the northwest quarter, east half of the southwest quarter, and southwest quarter of the southeast quarter section 27, northeast quarter, northwest quarter, north half of the southwest quarter, and north half of the southeast quarter section 28, north half of the southwest quarter section 29, southeast quarter of the northwest quarter section 30, north half of the northeast quarter, and north half of the northwest quarter section 32, north half of the northeast quarter, and northeast quarter of the northwest quarter section 33, east half of the northeast quarter, south half of the northwest quarter, east half of the southwest quarter, and west half of the southeast quarter section 34, township 23 north, range 1 west, Montana principal meridian, for the Muddy Creek Reservoir site, Sun River project; and the northwest quarter of the northeast quarter section 35, township 32 north, range 32 east, north half of the southwest quarter section 4, township 31 north, range 32 east, and all of section 36, township 32 north, range 31 east, Montana principal meridian, for the Nelson Reservoir site, Milk River project; the Secretary of the Interior is authorized to issue patents to said State for such vacant, surveyed, unreserved, unoccupied, nonmineral public lands as may be selected by said State within its boundaries, not exceeding the amount of land included in said deeds and said land when so reconveyed shall not be subject to settlement, location, entry, or selection under the public-land laws, but shall be reserved for the use of the United States Reclamation Service for the purposes aforesaid: *Provided, however,* That the Secretary of the Interior may restore such lands as he may determine are not needed for said reservoir sites.

RELIEF OF ENTRYMEN, CASTLE PEAK PROJECT.

An act for the relief of entrymen within the Castle Peak irrigation project, in Utah.
(Act of Feb. 28, 1919, Public No. 308.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any qualified entryman who has heretofore made bona fide entry upon land subsequently withdrawn under the provisions of the reclamation act of June 17, 1902 (32d Stats., p. 388), for the Castle Peak irrigation project, in Utah, upon filing an application to have his entry made subject to all the charges, terms, conditions, provisions, and limitations of the reclamation act, together with a satisfactory showing of full compliance with the homestead laws under which such entry was made to the date of such application, may be granted leave of absence from the land until the Secretary of the Interior announces the availability of a water supply for the irrigation of the land, or until the lands embraced in his entry shall be restored to the public domain: *Provided,* That the period of actual absence under this act shall not be deducted from the full time of residence required by law.

SUNDRY CIVIL APPROPRIATION ACT FOR 1920.

An act making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1920, and for other purposes. (Act of July 19, 1919, Public No. 21.)

* * * * *

RECLAMATION SERVICE.

The following sums are appropriated out of the special fund in the Treasury of the United States created by the act of June 17, 1902, and therein designated "the reclamation fund":

For all expenditures authorized by the act of June 17, 1902, (32d Stats., p. 388), and acts amendatory thereof and supplementary thereto, known as the reclamation law, and all other acts under which expenditures from said fund are authorized, including salaries in the District of Columbia and elsewhere; examination of estimates for appropriations in the field; printing and binding; law books, books of reference, periodicals, engineering and statistical publications, not exceeding \$1,500; purchase, maintenance, and operation of horse-drawn or motor-propelled passenger-carrying vehicles; payment of damages caused to the owners of lands or private property of any kind by reason of the operations of the United States, its officers or employees, in the survey, construction, operation, or maintenance of irrigation works, and which may be compromised by agreement between the claimant and the Secretary of the Interior; and payment for official telephone service in the field hereafter incurred in case of official telephones installed in private houses when authorized under regulations established by the Secretary of the Interior:

Salt River project, Arizona: For examination of project and accounts, \$1,000;

Yuma project, Arizona-California: For operation and maintenance, continuation of construction, and incidental operations, \$383,000;

Orland project, California: For maintenance, operation, continuation of construction, and incidental operations, \$113,000;

Grand Valley project, Colorado: For operation and maintenance, continuation of construction, and incidental operations, \$192,000, together with the unexpended balance of the appropriation for the project for the fiscal year 1919;

Uncompahgre project, Colorado: For operation and maintenance, continuation of construction, and incidental operations, \$206,000;

Boise project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, \$664,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919: *Provided*, That no money shall be expended for extensions of the Boise project, except such amounts as may be collected from construction charges on that project under public notice;

King Hill project, Idaho: For continuing construction and incidental operations, \$332,000: *Provided*, That no part of this appropriation shall be expended for the King Hill project if without consent of the Secretary of the Interior any lands are hereafter released from any part of the irrigation district assessments apportioned against the same by the board of directors of the King Hill irrigation district;

Minidoka project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, \$463,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Huntley project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$95,000;

Milk River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$234,000;

Sun River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$141,000;

Lower Yellowstone project, Montana-North Dakota: For operation and maintenance, construction work, and incidental operations, \$59,000;

North Platte project, Nebraska-Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$880,000;

Newlands project, Nevada: For operation and maintenance, continuation of construction, and incidental operations, \$359,000, together with the unexpended balance of the appropriation for this project for the fiscal year, 1919;

Carlsbad project, New Mexico: For operation and maintenance, and incidental operations, \$81,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Rio Grande project, New Mexico-Texas: For operation and maintenance, continuation of construction, and incidental operations, \$1,250,000, together with the unexpended balance of the sum appropriated for this project for the fiscal year 1919: *Provided*, That no part of this appropriation shall be expended for drainage except in irrigation districts formed under State laws and upon the execution of agreements for the repayment to the United States of all project investments;

North Dakota pumping project, North Dakota: For maintenance, operation, and incidental operations, \$85,000, together with the unexpended balance of this appropriation for this project for the fiscal year 1919;

Umatilla project, Oregon: For operation and maintenance, continuation of construction, and incidental operations, \$113,000;

Klamath project, Oregon-California: For operation and maintenance, continuation of construction, and incidental operations, \$357,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Belle Fourche project, South Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$141,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Strawberry Valley project, Utah: For operation and maintenance, continuation of construction, and incidental operations, \$55,000;

Okanogan project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$325,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Yakima project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$353,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1919;

Shoshone project, Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$343,000, together with the unexpended balance of the sum appropriated for this project for the fiscal year 1919;

Secondary projects: For cooperative and other miscellaneous investigations, \$100,000;

Under the provisions of this act no greater sum shall be expended, nor shall the United States be obligated to expend, during the fiscal year 1920, on any reclamation project, appropriated for herein an amount in excess of the sum herein appropriated therefor, nor shall the whole expenditures or obligations incurred for all of such projects for the fiscal year 1920 exceed the whole amount in the "reclamation fund" for that fiscal year;

Ten per cent of the foregoing amounts shall be available interchangeably for expenditures on the reclamation projects named; but not more than 10 per cent shall be added to the amount appropriated for any one of said projects;

The proceeds heretofore or hereafter received from the lease of any lands reserved or withdrawn under the reclamation law or from the sale of the products therefrom shall be covered into the reclamation fund; and where such lands are affected by a reservation or withdrawal under some other law, the proceeds from the lease of land and the sale of products therefrom shall likewise be covered into the reclamation fund in all cases where such lands are needed for the protection or operation of any reservoir or other works constructed under the reclamation law, and such lands shall be and remain under the jurisdiction of the Secretary of the Interior;

In all, for the Reclamation Service, \$7,325,000.

For reimbursement to the reclamation fund the proportionate expense of operation and maintenance of the reservoirs for furnishing stored water to the lands in Yakima Indian Reservation, Wash., in accordance with the provisions of section 22 of the act of August 1, 1914 (38 Stat., p. 604), there is appropriated, out of any money in the Treasury not otherwise appropriated, \$11,000.

.

RESOLUTION REGARDING APPROPRIATIONS.

Joint resolution to ratify and confirm from and including July 1, 1919, obligations incurred pursuant to the terms of certain appropriations for the fiscal year 1920. (Resolution of July 31, 1919, H. J. Res. 174.)

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That appropriations for the service of the fiscal year 1920, contained in the Agricultural, Army, District of Columbia, Navy, and sundry civil appropriations acts, and the "Third deficiency appropriation act, fiscal year 1919," shall be available from and including July 1, 1919, for the purposes respectively provided in the said appropriations for the service of the said fiscal year. And all obligations incurred pursuant to the terms of such appropriations in the aforesaid acts as approved are ratified and confirmed from and including July 1, 1919.

LAW DECISIONS.

COURT PROCEDURE.

Removal of suits against project managers.—The project manager of a Federal irrigation project is the governmental representative through whom the project is managed and carried on. He is engaged in the administration of a Federal law and has the right to bring into the Federal courts controversies to which he is made a party touching the validity or propriety of acts done by him in his representative capacity. When sued in a State court for damages on account of his alleged negligence in operating a project canal, he can remove the cause to a Federal court. (*Whiffin v. Cole*, Boise project, memorandum decision, January 24, 1919, by Dietrich, district judge.)

ENTRIES AND ENTRYMEN.

Assignment of farm unit.—Where, prior to an exchange of reclamation farm units under the act of March 4, 1915 (38 Stat., 1215), the entryman has, in connection with the original unit, fulfilled the ordinary homestead requirements and submitted proper proof thereof, the lieu farm unit may be assigned, under the act of June 23, 1910 (36 Stat., 592), subject to compliance with the requirements of the reclamation law as to payment, reclamation, and cultivation. (*Sarah E. Lewellen*, 46 L. D., 385.)

LANDS.

Lands in California uncovered by recession of navigable waters.—Land underlying the waters of Little Klamath Lake, a navigable body of water and belonging to the State by virtue of her sovereignty, which during the greater part of the year, in ordinary seasons, is covered by the waters of the lake, and which is uncovered only at times of low water during the months when the water is at its lowest stage, is not land which is subject to purchase under section 3493m of the Political Code of California providing for the purchase of lands "now uncovered or which may be hereafter uncovered by the recession or drainage of the waters of inland lakes, and inuring to the State by virtue of her sovereignty," since the recession contemplated by the code section is a recession permanent or apparently so, and not one that is merely seasonal or periodical. (*Churchill Co. v. W. S. Kingsbury*, surveyor general, etc., 56 Calif., 83.)

■ *Title to swamp lands on Klamath project.*—The State of California made application to the General Land Office for a survey, with a view to the subsequent issuance of patent to the State under the swamp-land act of September 28, 1850 (9 Stat., 519), of alleged swamp and overflowed lands in T. 47 N., Rs. 2 and 3 E., and T. 48 N., Rs. 1, 2 and 3 E., M. D. M., California. The lands for which survey and patent were asked are areas lying between the precipitous banks in the lower portion of the lower Klamath Lake area and the high ground.

The department in denying the application of the State in an opinion dated June 25, 1919, held that under the act of the State of California of February 3, 1905 (Calif., Stats. 1905, p. 4), these lands were ceded to the United States and are now held subject to disposition only under the general reclamation laws; that the department is without authority to recognize or entertain any claim on the part of the State therefor under the swamp-land act or under any other existing law, and that the title of the United States to these lands can be divested only by act of Congress.

RECLAMATION FUND.

Telephones in private houses on projects.—Under the act of July 1, 1918 (40 Stat., 673), whenever it is necessary in the opinion of the project manager of a Federal irrigation project, for the efficient transaction of Government business in connection with the project to have a telephone installed in a private house, request for permission to do so should be made to the chief of construction, with a full statement of the reasons why such permission should be granted. The chief of construction, after considering the request, may, in his discretion, grant authority for such installation. When transmitting for approval contracts covering such telephone service, the form letter of transmittal shall contain a reference to the authority so granted, and likewise a reference must be made to such authority on all vouchers in payment of such telephone service, in order that they may be settled without question by the auditor. (Departmental decision, Aug. 19, 1918.)

Transfer of moneys to the reclamation fund.—In order to expedite the availability of moneys from the sale of public lands, which moneys are actually in the Treasury and belong to the reclamation fund, so that they may be promptly utilized in expenditures by the Reclamation Service, the division of bookkeeping and warrants of the office of the Auditor for the Department of the Interior may issue appropriation warrants transferring the proceeds in question to the reclamation fund upon quarterly certifications made by the Commissioner of the General Land Office, without awaiting the examination and audit of the vouchers covering the sales of the lands. (Comp. Dec., Sept. 25, 1918.)

Receipts from potassium deposits.—Moneys received from royalties and rentals under the act of October 2, 1917 (40 Stat., 297), which authorizes exploration for and disposition of potassium on public lands, should not first be deposited to the credit of sales of public lands, but should be credited direct to the reclamation fund. (Comp. Dec., Dec. 5, 1918.)

Stamp tax on donation deed.—If a grantor of land to the United States for a nominal consideration pays the stamp taxes provided for deeds of conveyance under the "Revenue act of 1918," approved February 24, 1919 (Public, No. 254), he may properly be reimbursed therefor from the reclamation fund as a part of the consideration for the land conveyed. (Comp. Dec., Apr. 22, 1919.)

RIGHT-OF-WAY ACT OF AUGUST 30, 1890.

Right-of-way reservation an encumbrance on title.—A provision in a contract for the sale of land that the seller will deliver to the buyer an abstract of title to the land, showing the title of the seller to be free and clear of encumbrances, is not complied with by the furnishing of an abstract which shows that the seller's title to the land is subject to a right of way for ditches or canals to be constructed by the Government of the United States under the act of Congress of August 30, 1890 (26 Stat., 391), which saves to the Government the right to enter upon lands, for which patents might be issued, for the purpose of constructing canals and ditches to reclaim arid lands. (*Cosby v. Danziger*, 27 Cal., App. 344.)

Compensation under right-of-way act.—When the United States utilizes a right of way under this act the landowner may be compensated for the actual value of his improvements on the right of way but no allowance can be made for the resultant damages to the farm. (Departmental decision Apr. 24, 1919.)

WATER CHARGES.

Payment of water charges by soldiers.—Under section 501, act of March 8, 1918 (40 Stat., 440), a homestead entryman's right is not to be "forfeited or prejudiced" by reason of his failure to do any act required by any law during the period of the military service. Under this provision he is excused from the payment of charges accruing during the period of such service if he so desires, his liability therefor being suspended in the meantime. Otherwise the water user, after the completion of his military service, would be confronted with not only the then current charges but also all charges accruing during his military service, placing a heavy immediate burden upon him which might greatly prejudice his ability to perfect his entry and water-right application. While the owners of private land covered by a water-right application are not expressly within said section 501, since the private lands are presumably irrigated as an incident to the irrigation and ensuing disposition of the public land, the same rule is applicable to them. Congress has not extended any relief to such water users as to defaults in the payment of construction and operation and maintenance charges, together with the penalties imposed by sections 3 and 6 of the reclamation extension act of August 13, 1914 (38 Stat., 686), accruing prior to their induction into the military service. Such water-right applications are subject to forfeiture or cancellation if there is a default under the law at the beginning of the military service. The department, however, will not exercise its power of forfeiture or cancellation during the military service, and will defer action toward such forfeiture and cancellation or the institution of any suit for the recovery of the amounts in default and the penalties until the expiration of the military service. Under section 501, supra, the penalties arising under said sections 3 and 6 of the reclamation extension act upon such prior defaulted construction or operation and maintenance charges will not run during the period of the military service. The homestead entryman under the said section 501 is relieved from paying the construction charge accruing during the period of his military service, and this same rule applies in the case of an owner of private land. As to these the duration of the military service will be excluded from the period fixed for the annual

payments of such charges in sections 1 and 2 of the reclamation extension act, as the case may be. The operation and maintenance charge is an annual charge for each year, and similarly may be paid by the water user after his discharge from the military service, the time for the payment thereof being hereby extended by a period equal to his military service. The usual bills should be sent under the provisions of the various public notices and regulations to all holders of project lands who have enlisted in the military service. These bills should be accompanied by a statement that the same are subject to the provisions of the act of March 8, 1918. If payment is made, no further action is necessary. If payment is not made, however, the project manager should write a special letter to each holder of project land in the military service advising him that (a) the construction charges accruing during the period of his military service will be put over until the expiration of the 20-year period for making such payments, and (b) the time for payment of the operation and maintenance charges due at the time he entered the military service and also those charges which accrued during his military service will be extended from the date of his discharge for a period equal to his military service. (Departmental decision, May 16, 1919; C. L. No. 820.)

Under section 501, act of March 8, 1918 (40 Stat., 440), a soldier's assignee is entitled to the same privileges as a soldier in the payment of construction and operation and maintenance charges. Where charges became due during the period of military service and were paid by the soldier, or a member of his family during the service of the soldier without knowledge of the concession given by the law, refund should be made if requested by the soldier. (Departmental decision, Aug. 23, 1919; C. L. 849.)

Under section 501, act of March 8, 1918 (40 Stat., 440), and regulations thereunder, where the expiration of a period equal to the time of military service falls on a date other than the first day of the month, operation and maintenance charges may be paid, without penalty, on or before the first day of the next succeeding month. (Reclamation decision, Aug. 30, 1919; C. L. 849.)

WATER RIGHTS.

Right to waste and seepage water.—Landowners within a Federal irrigation project can not avail themselves of waste and seepage water arising in connection with the operations of the project when such water is claimed by the Government. (Memo. decision, June 26, 1918, State District Judge Isaac F. Smith, in re petition, Nampa-Meridian irrigation district for confirmation of contract with the United States.)

Under the revised statutes of Nebraska, 1913, sections 3426 and 3427, and in view of the general statutory scheme for the acquisition of water rights, as well as the repeal of the act of 1895, page 260, section 44, relating to the appropriation of seepage waters, a ditch company is not entitled to appropriate seepage waters escaping from a canal under a Federal irrigation project when the Government claims the right to the use of the seepage water, and the action of the Nebraska State board sustaining an attempted appropriation gave the ditch company no rights. (*United States v. Ramshorn Ditch Co.*, etc., 254 Fed., 842.)

LITIGATION.

[Cases initiated in the fiscal year ended June 30, 1919, marked thus: *.]

ARIZONA, SALT RIVER PROJECT.

W. B. Lount and Hattie L. Mosher v. Wm. S. Cone, Walter Ward, and Arthur J. Hattom.—Suit brought in the United States district court August 9, 1916, to enjoin alleged overflowing of plaintiffs' lands by Salt River Valley Canal, etc., and to recover \$10,000 damages. Case referred to special master in chancery and trial had May 8 to 14, 1919, inclusive. Decision pending.

May B. Marley v. Wm. S. Cone and Arthur J. Hattom.—Suit brought October 31, 1916, in United States district court for injunction restraining wasting water and to recover \$4,500 damages. Case dismissed.

* *James Aldrich and 141 others v. Salt River Valley Water Users' Association.*—Suit brought March 28, 1919, in the superior court for Maricopa County, Ariz., for injunction requiring defendant to permit plaintiffs (owners of lands within boundaries of project) to purchase water for the season of 1919. Case was removed to the United States district court, but remanded on court's own motion. Case pending.

ARIZONA-CALIFORNIA, YUMA PROJECT.

Yuma Valley Water Users' Association v. Schlecht and Caylor.—Suit filed June 30, 1917, in United States district court for injunction to restrain Reclamation Service from enforcing construction charge of \$75 per irrigable acre. Estimated amount involved \$1,902,588. Case tried April 28 to June 3, 1919, inclusive, and taken under advisement.

* *Mecca Land and Exploration Company v. Schlecht and Priest.*—Suit filed August 10, 1918, in the superior court of Yuma County, Ariz., for injunction restraining defendants from advertising for lease or leasing certain accretion lands along the Colorado River and within the boundaries of Yuma project, Arizona. Temporary restraining order issued on filing of suit. Case removed to United States district court and answer filed. Case pending.

CALIFORNIA, ORLAND PROJECT.

United States v. H. C. Angle and 495 others.—Suit brought May 28, 1918, in the United States district court for adjudication of water rights on Stone Creek and tributaries and for injunction. Preliminary injunction granted June 10, 1918, and E. T. Ericksen appointed water commissioner. Amended complaint filed April 3, 1919, bringing in new parties.

COLORADO, GRAND VALLEY PROJECT.

In re adjudication water rights, Grand River, District No. 42.—Petition filed November 2, 1908, in State district court. October 4, 1915, Colorado Supreme Court quashed writ of error without prejudice to United States, on ground that judgment was not final. Orchard Mesa irrigation district intervened to have its rights determined. Decree entered November 5, 1915. On November 6, 1915, motion of United States for new trial denied, written exceptions filed, and leave granted for extension of the record. No further proceedings have been had, although status is such that it can be reopened. The status of this litigation is entirely changed as a result of the making by the United States with the Palisade and Mesa County irrigation districts of certain perpetual contracts, respectively dated May 31, 1918, and June 10, 1918, in pursuance of which the United States will supply the irrigation water of the districts through the irrigation works of the Grand Valley project and in return secure for the benefit of the Grand Valley project the power water which has heretofore been used by the districts in pumping their irrigation water. In the past the Palisade irrigation district has used about 573 second-feet of water for power purposes to pump 80 second-feet of irrigation water, and the Mesa County irrigation district has used about 627 second-feet of water for power purposes to pump 40 second-feet of irrigation water. This wasteful use of water for power purposes to pump relatively small quantities of water for irrigation purposes is one of the principal questions involved in said litigation, and as said contracts settle to the satisfaction of the United States the matter of the use of the power water in question, further prosecution of said litigation will be unnecessary.

* *In re petition of the Palisade irrigation district.*—Case brought in State district court September 10, 1918, for confirmation of proceedings in connection with election and authorization of contract between the Palisade irrigation district and the United States. Decree of confirmation granted.

* *In re petition of the Mesa County irrigation district.*—Case brought in State district court September 10, 1918, for confirmation of proceedings in connection with election and authorization of contract between the Mesa County irrigation district and the United States. Decree of confirmation granted.

COLORADO, UNCOMPAHGRE PROJECT.

United States to the use of the Montrose Hardware Company et al. v. C. D. McPhee et al. (United States, Intervenor).—Suit brought September 11, 1905, in State district court. Appeal argued in Supreme Court of Colorado, January 17, 1916; decision rendered May 6, 1918; petition for rehearing denied July 1, 1918. Judgment in favor of the individual creditors was affirmed; judgment against the United States in favor of the Colorado sureties, except Orman, was reversed and remanded. The effect of the decision, however, is to subordinate the claims of the United States to those of the individual creditors, as the decision permits the individual creditors to collect from the sureties without reference to the claim of the United States. Case pending.

United States v. Martin Van Horn et al.—Suit brought April 25, 1912, in the United States district court for an injunction, and on same date temporary restraining order was granted. Temporary injunction issued June 12, 1912, and is still in force. The case is practically closed although the defendants still have the right to ask that the temporary injunction be set aside on final hearing.

United States v. George Lang.—Suit filed in 1912 in United States district court for the Dallas division of the northern district of Texas, to recover \$7,500 upon bond of Taylor-Moore Construction Co. in connection with construction of Gunnison Tunnel. Case pending.

United States v. George Schmucker.—Suit filed in 1912 in United States district court for the Dallas division of the northern district of Texas, to recover \$10,000 upon bond of Taylor-Moore Construction Co. in connection with construction of Gunnison Tunnel. Case pending.

United States v. A. F. Kirkpatrick.—Suit filed in 1912 in United States district court for the Dallas division of the northern district of Texas, to recover \$5,000 upon bond of Taylor-Moore Construction Co. in connection with construction of Gunnison Tunnel. Case pending.

United States v. Millard Fairlamb et al.—Suit filed November 27, 1916, in the United States district court to condemn land for right of way. Case pending.

United States v. Sophronia Thorniley et al.—Suit filed April 23, 1918, in the United States district court to condemn land for right of way. Order granting the United States immediate possession entered May 7, 1918. Case pending.

United States v. Hi F. Thorniley.—Suit brought April 23, 1918, in the United States district court to enjoin the defendant from interfering with the use by the United States of a right of way under the act of August 30, 1890. July 9, 1918, permanent restraining order entered against the defendant.

United States v. Morris et al.—Suit brought July 30, 1918, in the United States district court for the purpose of conserving the funds collected by other creditors than the United States in the case entitled "United States to the use of the Montrose Hardware Company et al. v. C. D. McPhee et al." (174 Pac. 808), in which the United States was an intervenor until the right of the United States to pro rate in such funds is determined. December 16, 1918, an order was entered restraining the defendants from disposing of any amounts realized from the judgment creditors, except interest collected on said judgments. Case pending.

IDAHO, BOISE PROJECT.

Farmers' Cooperative Ditch Co. v. Riverside Irrigation District et al.—Suit brought in August, 1902, in the State district court to adjudicate water rights in Boise River. Temporary order for irrigation season of 1918 secured from the Court in July, 1918. Case pending.

Page and Brinton v. United States.—Petition filed February 27, 1912, in Court of Claims for \$325,000 damages. Testimony completed. Case pending.

Pioneer Irrigation District v. American Ditch Co. et al.—Suit filed July 14, 1913, in State district court for adjudication of water rights acquired after those involved in case of Farmers' Cooperative Ditch

Co. v. Riverside Irrigation District et al. Testimony taken. Case pending.

United States v. American Ditch Co. et al.—Suit brought October 3, 1913, in United States district court to adjudicate water rights. Case pending.

Petrie et al v. Nampa & Meridian Irrigation District.—Proceedings brought in State district court to confirm election and other proceedings in connection with contract between district and the United States for furnishing water rights and drainage for the lands of the district. Case tried in 1915. Appeal taken to State supreme court, and judgment of trial court confirmed (153 Pac. 425). Appeal taken to United States Supreme Court. Argued in United States Supreme Court on November 18, 1918. Decision filed by United States Supreme Court on December 9, 1918, sustaining motion to dismiss appeal.

In re Petition of Nampa & Meridian Irrigation District—Confirmation of apportionment of benefits under contract with the United States.—Proceedings brought in the State district court for confirmation of apportionment of benefits made by directors of district under contract between the United States and the district. Tried December, 1917, and January, 1918. Opinion in letter written by trial judge June 26, 1918, sustaining contention of Reclamation Service confirming the apportionment of benefits made by the directors, but judgment not signed. Trial judge died shortly afterwards without signing decree. Case pending.

Payette-Boise Water Users' Association, v. D. W. Cole, et al.—Suit brought April 1, 1918, in State district court to prevent collection of construction charges announced by public notice of July 2, 1917. Case removed to Federal court on April 5, 1918. Application for temporary injunction argued on April 20, 1918, and temporary order entered on May 2, 1918, requiring payment of announced charges pending final trial of the case. Petition in intervention filed on June 4, 1918, by J. W. Hannum et al to compel delivery of water on rental basis. Argument on intervenor's application for temporary restraining order heard on June 12, 1918. Case finally tried from January 29, 1919, to February 11, 1919. Briefs filed and case taken under advisement. Case pending.

* *H. A. Griffiths et al v. D. W. Cole et al.*—Case filed in State district court for Canyon County on November 26, 1918, to restrain Government officers from constructing the Notus Canal on the ground that the Reclamation Service has no authority to reclaim private land, also plaintiff claims rights of way and water filings on drainage canal. Case removed to Federal court on December 19, 1918. Motion to dismiss sustained on February 13, 1919, but plaintiff allowed to amend. Motion to dismiss again allowed and plaintiff again allowed to amend on March 25, 1919. Case tried June 15, 1919. Case pending.

* *C. W. Whiffin v. D. W. Cole.*—Suit brought in State district court against project manager on December 7, 1918, for \$6,000 damages on account of break in one of the canals of the Boise project. Petition for removal to Federal court filed in the State district court on December 17, 1918. Removal resisted in the State court and argued before the State court. Order of removal signed by State judge December 24, 1918. Motion to remand filed in Federal court January 4, 1919,

and argued January 18, 1919. Order and opinion filed by Federal court on January 24, 1919, retaining jurisdiction and denying motion to remand. Case pending.

* *United States v. William C. H. Young et al.*—Suit filed on January 16, 1919, in the United States District Court to condemn right of way for Notus Canal for first subunit of the Black Canyon unit of the Boise project, right to condemn being contested on ground that the Service has no authority to irrigate private lands. Evidence as to right to condemn heard June 16, 1919. Case pending.

* *United States v. Wm. B. Hyslop.*—Suit filed on May 7, 1919, in the District Court of the United States, District of Idaho, to enjoin defendant from breaking or tampering with headgates on the Boise project, or diverting water without authority. Case heard on application for temporary injunction on May 10, 1919, and temporary restraining order issued pending final trial and now in effect.

* *United States v. J. M. Jorgenson.*—Suit filed on May 8, 1919, in the District Court of the United States, District of Idaho, to enjoin defendant from breaking or tampering with headgates on the Boise project, or diverting water without authority. Case heard on application for temporary injunction on May 10, 1919 and temporary restraining order issued pending final trial and now in effect.

* *Oliver O. Haga v. Nampa and Meridian Irrigation District.*—Suit filed on May 12, 1919, in United States District Court, District of Idaho, to restrain district from assessing plaintiff's lands for Government water rights under contract between the United States and the district. Motion to dismiss filed for lack of jurisdiction and on other grounds on May 13, 1919. Case pending.

* *Idaho Power Company v. United States.*—Suit filed on June 18, 1919, in the district court of the United States, District of Idaho, under the Tucker Act, to recover \$2,550, the alleged value of certain transformers leased by the United States from the company and destroyed by fire. Case pending.

IDAHO, KING HILL PROJECT.

In re petition King Hill Irrigation District for confirmation of apportionment of benefits under contract with the United States.—Suit filed in the State district court for Elmore County on November 5, 1918, for confirmation of apportionment of benefits under contract between the district and the United States. Answers and cross-complaint filed by various landowners seeking to be excluded from assessment. Case pending.

IDAHO, MINIDOKA PROJECT.

Snake River Valley Irrigation District v. John Empey.—Suit filed in the State district court of Bingham County to compel State water-master to open plaintiff's canal gates and allow plaintiff to take water which would have resulted in diverting from the river stored water from Jackson Lake belonging to Minidoka project. Case tried June 26, 1919. Decision rendered same day refusing to issue writ of mandate and holding plaintiff not entitled to open its gates or take water.

MONTANA, BLACKFEET (INDIAN) PROJECT.

George W. Cook and David La Breche v. United States.—Suit brought in 1911 in the United States district court for \$25,000 damages and for an injunction. Claimants were paid \$16,445.07 and accepted by them for all improvements on their land. On June 3, 1919, Senator Walsh of Montana introduced Senate bill 1329 providing for the additional payment to Messrs. Cook and LaBreche of \$5,944.93 in consideration of the relinquishment by them of all interest in their allotments and of their right to select lieu land under the provisions of the act of June 25, 1910. Bill referred to the Committee on Indian Affairs.

MONTANA, FLATHEAD (INDIAN) PROJECT.

No litigation.

MONTANA, FORT PECK (INDIAN) PROJECT.

No litigation.

MONTANA, HUNTLEY PROJECT.

No litigation.

MONTANA, MILK RIVER PROJECT.

No litigation.

MONTANA, SUN RIVER PROJECT.

United States v. William B. Orser.—Suit to collect \$1,190.80 unpaid water charges, was filed in the district court, United States district of Montana, on August 15, 1916. Judgment was not entered and an amended complaint covering delinquent charges to date (\$1,641.02) was filed in June, 1918. Defendants filed demurrer which was overruled and the case is now pending on motion for judgment on the pleadings.

MONTANA-NORTH DAKOTA, LOWER YELLOWSTONE PROJECT.

Widell-Finley Company et al. v. United States.—Suit filed February 9, 1912, in Court of Claims for \$226,852.02, account contract Belle Fourche project, South Dakota. United States filed counter claim of \$86,000 on account excess cost to the United States over contract price on lower Yellowstone project. Case still pending.

United States v. John C. Reed.—Suit brought in United States district court in August, 1917, for the recovery of \$40 for lease of lands. Claim paid and defendant billed for costs amounting to \$45. Defendant has requested and the United States Attorney recommends granting of extension of time until November 1, 1919, in which to make payment of these court costs.

* *United States v. Ole Olson.*—Suit brought on February 25, 1919, in the United States district court for district of Montana, to recover \$2,553.07 delinquent water-right charges. Olson thereafter accepted the terms of water rental order of March 31, 1919, and made payment of costs in the sum of \$19.15, whereupon recommendation was made for dismissal of the suit.

* *United States v. Josephine Olson*.—Suit brought on February 25, 1919, in the United States district court for district of Montana, to recover \$2,954.15 delinquent water-right charges. Mrs. Olson thereafter accepted the terms of water-rental order of March 31, 1919, and made payment of costs in the sum of \$19.15, whereupon recommendation was made for dismissal of the suit.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT.

S. R. H. Robinson & Son Contracting Co. v. United States.—Suit filed in Court of Claims, November 7, 1913, for \$100,531.86, covering excess costs and penalties on forfeited contract completed by United States. Decision June 3, 1918, awarded judgment against United States for \$21,275.67. The United States filed a motion for rehearing which was denied. Money for payment of judgment was appropriated by act of Congress of November 4, 1918, and payment made.

Albert J. Bothwell and Bothwell Co. v. United States.—Petition filed in Court of Claims June 9, 1915, for \$125,000, covering damage to hay flooded, loss on pure-bred cattle sold as beef cattle and loss of pure-bred cattle business, account Pathfinder Reservoir flooding condemned ranch. Amended petition filed February 5, 1916; amendment to amended petition filed May 26, 1916; all evidence taken: briefs submitted but decision not yet rendered.

United States v. Ramshorn Ditch Co.—Suit for injunction filed in United States district court, August 21, 1917, to restrain State engineer and Ramshorn Ditch Co. from diverting approximately 40 second-feet of recaptured seepage water. The court held on December 14, 1918, that defendant was not entitled to appropriate the seepage water escaping from the Government canal.

NEVADA, NEWLANDS PROJECT.

John Horstman Company v. United States.—Suit filed in Court of Claims for \$35,000 damages. Petition of plaintiff dismissed April 7, 1919.

Natron Soda Company v. United States.—Suit filed in Court of Claims for \$170,000 damages. Petition of plaintiff dismissed April 7, 1919.

State of California v. The Truckee River General Electric Company, A. P. Davis, et al.—Suit to determine ownership of State in lands below high-water mark, Lake Tahoe, and for removal of outlet dam. Brought in State court, Placer County, Calif., and removed to United States district court. Suit dismissed January 20, 1919, for lack of prosecution; order of dismissal qualified by statement permitting reinstatement on proper showing, or upon stipulation. July 1, 1919, attorney general for the State of California filed motion for reinstatement. Hearing on motion pending.

United States v. Orr Water & Ditch Co.—Suit filed March 3, 1913, in the United States district court for the adjudication of water rights on Truckee River and tributaries. Case pending.

The Western Company v. The Truckee River General Electric Company et al.—Suit brought September 24, 1912, in the United States District Court to enjoin changing level of Lake Tahoe. Case pending.

NEW MEXICO, CARLSBAD PROJECT.

United States v. A., T. & S. F. Ry. Co.—In United States District Court for New Mexico. Filed September 11, 1916, for condemnation of certain rights. Amount involved indeterminate. Case dismissed December 17, 1918, compromise having been reached.

United States v. J. J. Alexander.—In United States District Court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest as noted next below, by payment of award of \$4,979.90.

United States v. J. J. Alexander.—In United States Circuit Court of Appeals, Eighth Circuit. Appeal July 19, 1918, from United States District Court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. Chas. A. Bigelow et al.—In United States District Court for New Mexico. Filed January 15, 1915, for condemnation of land and other rights. Amount involved estimated, round numbers, at \$160,000. Certain features of case settled by payment under judgments dated January 30, 1918. Other features, involving approximately \$65,000, argued and submitted and now under consideration by district court.

United States v. H. A. Bock.—In United States District Court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest as noted next below, by payment of judgment for principal sum of \$2,688.60.

United States v. H. A. Bock.—In United States Circuit Court of Appeals, Eighth Circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. E. C. Cook et al.—In United States District Court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest as next below noted, by payment of principal sum of \$3,243.

United States v. E. C. Cook et al.—In United States Circuit Court of Appeals, Eighth Circuit. Appeal July 19, 1918, from United States District Court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. John Carothers et al.—In United States District Court for New Mexico. Condemnation of land: Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest as next below noted, by payment of principal sum of \$4,355.75.

United States v. John Carothers et al.—In United States Circuit Court of Appeals, Eighth Circuit. Appeal July 19, 1918, from United States District Court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case

continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. Clara E. Courtney.—In United States District Court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest as next below noted, by payment of principal sum of \$3,844.75.

United States v. Clara E. Courtney.—In United States Circuit Court of Appeals, Eighth Circuit. Appeal July 19, 1918, from United States District Court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. Frank Edwards.—In United States District Court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$1,830.72.

United States v. Frank Edwards.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico. In matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. John Fidell.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$440.50.

United States v. John Fidell.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued on stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. Mary Fidell.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$1,833.50.

United States v. Mary Fidell.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued on stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. E. F. Hardwick.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$3,809.

United States v. E. F. Hardwick.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court, in matter of interest on award in case next above noted;

amount involved indeterminate. Case continued under stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. Margie L. Highsmith.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$16,375.84.

United States v. Margie L. Highsmith.—In United States Supreme Court. Writ of error from Supreme Court to United States circuit court of appeals, eighth circuit, allowed June 23, 1919, to review decision of latter court affirming judgment of United States district court for New Mexico, allowing interest on the principal sum awarded by verdict in case last above noted.

United States v. Mrs. Marshall K. Holt.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$277.80.

United States v. Mrs. Marshall K. Holt.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. A. A. Kaiser.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in *United States v. Chas. A. Bigelow et al*, a consolidated condemnation suit, of which this case is an outgrowth. Amount involved indeterminate.

United States v. Herbert Litton.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$1,205.

United States v. Herbert Litton.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. Don F. Lyman.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$1,649.25.

United States v. Don F. Lyman.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. Amie D. McHenry.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$8,153.25.

United States v. Amie D. McHenry.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme court in test cases involving same points.

United States v. H. C. Maynard et al.—In United States district court for New Mexico. Suit for injunction against unlawful diversion of water to detriment of project, filed July 16, 1917. Temporary restraining order issued and suit dismissed March 21, 1919, its purpose having been served.

United States v. R. W. Rankin.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$10,821.30.

United States v. R. W. Rankin.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued on stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. I. C. Roberts.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$2,548.

United States v. I. C. Roberts.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. W. L. Rogers et al.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as next below noted, by payment of principal sum of \$76.65.

United States v. W. L. Rogers et al.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. William E. Rogers et al.—In United States Supreme Court. Writ of error from Supreme Court to United States circuit court of appeals, eighth circuit, allowed June 23, 1919, to review decision of latter court affirming judgment of United States district

court for New Mexico, allowing interest on principal sum awarded by the commissioners in *United States v. Chas. E. Bigelow et al.*, a consolidated condemnation suit, of which this case is an outgrowth. Amount involved indeterminate.

United States v. John W. Sanner et al.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$5,231.84.

United States v. John W. Sanner et al.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. C. Bert Smith.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$3,114.57.

United States v. C. Bert Smith.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued on stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. H. E. Steadman.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$1,939.95.

United States v. H. E. Steadman.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action by United States Supreme Court in test cases involving same points.

United States v. E. H. Vance.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$1,753.15.

United States v. E. H. Vance.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

United States v. C. E. Vaughn.—In United States district court for New Mexico. Condemnation of land. Appeal from award of commissioners filed May 7, 1917. Case settled, except in matter of interest on award as noted in case next below, by payment of principal sum of \$1,752.30.

United States v. C. E. Vaughn.—In United States circuit court of appeals, eighth circuit. Appeal July 19, 1918, from United States district court for New Mexico, in matter of interest on award in case next above noted; amount involved indeterminate. Case continued by stipulation to await action of United States Supreme Court in test cases involving same points.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT.

El Paso Valley Water Users' Association v. W. H. Austin et al.—In United States district court, western district of Texas. Suit filed April 29, 1912, for adjudication of water rights of Rio Grande in Texas. Case pending. Amount involved indeterminate.

El Paso Valley Water Users' Association v. Mrs. L. L. Bowen et al.—In forty-first district court of El Paso County, Tex. Suit filed February 4, 1918, to restrain defendants from interfering with United States in construction of drainage ditch over defendant's land under right of way granted in stock subscription contract with association. Temporary injunction granted and appeal to supreme court of Texas, mentioned in Seventeenth Annual Report, was dismissed March 1, 1919, on ground that court was without jurisdiction. Amount involved indeterminate.

Oscar C. Snow v. Francisco Abalos et al.—In district court for third judicial district of New Mexico. Suit filed October 24, 1912, for adjudication of water rights of Rio Grande in Texas. Amount involved indeterminate. Case pending.

Nellie D. Sperry v. Chamberino Community Ditch Co. et al.—In district court, third judicial district of New Mexico. Suit filed March 31, 1916, against employees of the Reclamation Service and others seeking injunction against operation of a certain flume account alleged defective construction, and asking for \$5,000 damages. Injunction denied, but case pending on claim for damages.

United States v. A., T. & S. F. Ry. Co.—In United States District Court for New Mexico. Suit filed October 29, 1915, for condemnation of land and other property required for right of way. Amount involved indeterminate. Case will be dismissed under compromise agreement.

United States v. Elmer C. Beezly.—In United States District Court for Western District of Texas. Suit filed October 13, 1917, for condemnation of land required as right of way. Amount involved \$60 and certain legal questions not monetary. Compromise agreement has been reached and case will be dismissed when title has been approved and payment made.

United States v. W. F. Payne.—In district court for western district of Texas. Suit filed October 13, 1917, for condemnation of land required as right of way. Amount involved \$326 and certain questions not monetary. Compromise agreement has been reached and case will be dismissed when title has been approved and payment made.

El Paso Valley Water Users' Association v. H. S. Bozarth et al.—In forty-first district court of El Paso County, Tex. Suit filed October 15, 1918, to restrain defendants from interfering with United States in construction of canal and lateral across defendants' land claimed under grant of right of way contained in stock subscription

contract with the association. Temporary restraining order was issued. Compromise agreement was reached on basis of Government's original offer and suit will be dismissed when title is approved and payment made. Amount involved \$159.50.

NORTH DAKOTA, NORTH DAKOTA PUMPING PROJECT.

No litigation.

OREGON, UMATILLA PROJECT.

No litigation.

OREGON-CALIFORNIA, KLAMATH PROJECT.

Lost River adjudication.—In the circuit court of the State of Oregon for Klamath County. Suit to determine water rights on Lost River. Original proceeding before State water board. Final decree. United States made no appearance except to file suggestion in the original hearing before the board.

United States v. J. P. Harter.—In the United States District Court for Northern California. Filed March 15, 1918. Ejectment suit. Amount involved indeterminate. Issues made up and case is pending.

City of Klamath Falls v. Klamath Canal Company, Klamath Water Users' Association, and J. B. Bond.—In the circuit court of the State of Oregon for Klamath County. Answer on behalf of J. B. Bond filed by United States district attorney and district counsel on August 19, 1918. Suit to recover possession of canal right of way over streets of the city. Case on calendar.

SOUTH DAKOTA, BELLE FOURCHE PROJECT.

Widell-Finley Co. et al. v. United States.—Suit filed in Court of Claims, February 9, 1912, for \$226,852.02, covering disputed classification material, extra work, etc. Briefs were submitted during the past fiscal year, but the decision has not yet been rendered.

Samuel R. H. Robinson v. United States.—Suit filed in Court of Claims, November, 1913, for \$17,145.25, damage to contractors' work by Government employees opening sluice gates during flood, extra work, etc. The case was argued and submitted and decision of the court rendered for defendant on December 16, 1918, with judgment against plaintiff for costs.

UTAH, STRAWBERRY VALLEY PROJECT.

* *In re petition of Mapleton Irrigation District.*—Proceedings brought in State district court for confirmation proceedings in connection with organization of the Mapleton Irrigation District and election and authorization of contract between said district and the United States. Decree granted.

* *In re petition of Springville Irrigation District.*—Proceedings brought in State district court for confirmation of proceedings in connection with organization of the Springville Irrigation District and election and authorization of contract between said district and the United States. Decree granted.

* *In re petition of United States*.—Proceedings brought in State district court June, 1919, for extension of time in the making of final proof of beneficial use under application No. 79 covering the appropriation of water for the Strawberry Valley project. On June 28, 1919, decree granted extending time to January 22, 1930.

WASHINGTON, OKANOGAN PROJECT.

Town of Okanogan v. United States and Calvin Casteel.—Suit brought in the United States district court for the eastern district of Washington for injunction restraining the defendants from cutting off water supply from Shull Springs. Suit involves the interpretation of a water contract dated December 3, 1909. Case pending.

WASHINGTON, YAKIMA PROJECT.

Theodore Weisberger v. United States.—Suit filed January 22, 1914, in Court of Claims for \$91,803.33. Judgment given plaintiff December 2, 1918, for \$71,999.46.

United States v. Aimee Francis Fear and Joseph H. Freuerbach.—Suit brought June 12, 1918, in the United States district court to condemn lands for right of way for canal. Case pending.

* *Joseph F. Walsh v. R. K. Tiffany, et al.*—Suit brought November 19, 1918, in State court to restrain defendants from canceling contract dated February 17, 1909, for the removal of timber bordering on Lake Clealum. Case pending.

WYOMING, JACKSON LAKE ENLARGEMENT.

United States v. B. D. Sheffield et al.—On June 20, 1914, suit was filed in the Federal court for the district of Wyoming to condemn lands. The court issued an order giving the United States immediate possession. A special act of Congress passed June 28, 1916 (39 Stat., 1305) provides for settlement of this case without cost to the project by authorizing the conveyance of a small tract of adjacent public land to the defendant in lieu of the private land used for reservoir purposes. Deeds conveying the private land to the United States have been placed in escrow but the completion of the exchange has been delayed on account of certain defects in title which are in process of being cleared up.

WYOMING, SHOSHONE PROJECT.

United States Fidelity & Guaranty Co. v. United States.—Suit brought in 1912 in the Court of Claims for the recovery of \$822,777.58. Judgment in order to pay for \$322,164.67 entered of record June 10, 1918. Provision for payment of judgment made in the "first deficiency appropriation act, 1919," approved November 4, 1918, and payment made by the Auditor.

* *Lincoln Land Company et al. v. Frank E. Weymouth and Geo. O. Sanford (The United States)*.—Suit brought in the district court of the United States for the district of Wyoming July 2, 1918, for an injunction against the diversion and use by the United States of the waters of Bitter Creek. Answer filed by the United States praying for an injunction against interference by the defendants with the irrigation

or drainage works of the United States. Hearing at Cheyenne, Wyo., on January 28 to 31, 1919. The matter taken under advisement by the court. Plaintiff and defendants filed briefs. Decision not yet rendered.

* *United States v. Arthur W. Ide, Grant Caldwell and H. B. Loomis.*—Suit brought in the district court of the United States for the district of Wyoming, July 3, 1918, for an injunction against interference by the defendants with the operations of the United States in constructing irrigation and drainage ditches across the lands of the defendants. Hearing had at Cheyenne, Wyo., January 28 to 31, 1919, inclusive. The matter taken under advisement by the court. Plaintiff and defendant filed briefs. No decision yet rendered.

* *United States v. R. R. Wright.*—Action brought in the Federal court February 28, 1919, charging defendant with embezzlement of funds of the United States in the amount of \$804.17 in connection with his duties as special fiscal agent on the Shoshone project. Defendant was indicted on eight counts by the grand jury on May 14, 1919; trial held at Cheyenne, Wyo., May 28–29, 1919; defendant found guilty on five counts and sentenced to pay a fine of \$725.51 and to imprisonment in the penitentiary at Leavenworth, Kans., for a period of one year and one day.

PURCHASES OF RIGHTS AND PROPERTY.

The following purchases of rights and property were made during the fiscal year ending June 30, 1919:

Purchases of rights and property.

ARIZONA-CALIFORNIA, YUMA PROJECT.

Vendor.	Description.	Consideration.	Date of contract.
Muhelm, Jos. M.....	Improvements on part of NE. $\frac{1}{4}$ sec. 4, T. 10 S., R. 24 W., G. & S. R. M.	\$354.00	Dec. 16, 1918
Vomocil, Ladislav.....	Improvements on part of farm unit D, lot 7, sec. 16, and lot 8, sec. 15, T. 16 S., R. 23 E., S. B. M.	125.90	June 4, 1918

COLORADO, GRAND VALLEY PROJECT.

Skinner, R. M., and May Skinner. Do.....	0.27 acres in the NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 3, T. 11 S., R. 98 W., 6th P. M. 0.40 acres in the NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 3, T. 11 S., R. 98 W., 6th P. M.	\$415.00 400.00	Mar. 1, 1919 Do.
---	--	--------------------	---------------------

IDAHO, BOISE PROJECT.

Allen, C. H., and Charlott....	Right of way in sec. 21, T. 5 N., R. 5 W., B. M., containing 9.5 acres.	\$1.00	Nov. 15, 1918
Brush, George H.....	Right of way in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 20, T. 5 N., R. 5 W., B. M., containing 2.5 acres.	1.00	Mar. 7, 1919
Carlyle, M. W.....	Right of way in secs. 17 and 18, T. 5 N., R. 5 W., B. M., containing 11.8 acres.	1.00	Oct. 2, 1918
Carlyle, Wm. H.....	Right of way in secs. 7 and 18, T. 5 N., R. 5 W., B. M., containing 12.50 acres.	1.00	Sept. 17, 1918
Dilley, Edgar, and Anna C....	Right of way in sec. 21, T. 5 N., R. 5 W., B. M., containing 3.6 acres.	1.00	Oct. 24, 1918
Froman, I. S., and S. E.....	Right of way in sec. 20, T. 4 N., R. 3 W., B. M., containing 2.13 acres.	250.00	Apr. 11, 1919
Hanley, Elizabeth, and L. B..	Right of way in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 36, T. 4 N., R. 3 W., B. M., containing 2.49 acres.	299.00	Mar. 10, 1919

IDAHO, KING HILL PROJECT.

Galloway, A. F., and Hattie L. Walker, Geo., and Louise H.. Do.....	Lot 7, block 2, King Hill townsite..... Lots 4 by 5, block 18, King Hill townsite..... Lot 9, block 2, King Hill townsite.....	\$100.00 400.00 85.00	Mar. 12, 1919 Dec. 2, 1918
---	--	-----------------------------	-------------------------------

MONTANA, MILK RIVER PROJECT.

Robinson, H. G., and wife....	Tract of land containing 353.42 acres: SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 19; that portion of the NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 20 lying north of waste-water ditch NW.-1; and in sec. 30, W. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$, lots 2 and 3; and that portion of the N. $\frac{1}{4}$ SE. $\frac{1}{4}$ lying north of waste-water ditch NW.-1, all in T. 32 N., R. 33 E., M. P. M.	\$10,602.60	Feb. 3, 1919
-------------------------------	--	-------------	--------------

Purchases of rights and property—Continued.

MONTANA, SUN RIVER PROJECT.

Vendor.	Description.	Consideration.	Date of contract.	Date approved.
State of Montana.....	Easement for telephone line.....	None.	Aug. 9, 1917	June 25, 1918
Catherine M. Beecher.....	Easement for telephone line from Willow Creek to North Side Canal line.	\$1.00	Apr. 25, 1918	June 23, 1918
Andy G. Kale.....	Easement securing retention of Giltman Sun River D. road in present economic location.	1.00	Nov. 17, 1918	Mar. 11, 1919
Lovina Kale.....	do.....	1.00	Nov. 18, 1918	Do.
Flowerree Sheep & Horse Co.	Easement for operation road along Greenfields Canal.	1.00	Oct. 4, 1918	Mar. 20, 1919
Bergetta Smith.....	Easement for operation road along Sun River slope canal.	1.00	Oct. 17, 1918	Mar. 11, 1919
Henningsen Land Co.....	do.....	1.00	Oct. 10, 1918	Mar. 20, 1919
Andrew E. Carper and Anna Carper.	Easement securing retention of Giltman Sun River D. road in its present economic location.	1.00	Jan. 20, 1919	Do.
State of Montana.....	Right of way across State land ¹ .			

MONTANA-NORTH DAKOTA, LOWER YELLOWSTONE PROJECT.

Vendor.	Description.	Consideration.	Date of contract.
Adams, W. K.....	45.6 acres of land for main canal right of way and 3.1 acres of land for lateral right of way in secs. 7 and 17, T. 19 N., R. 58 E., M. F. M.	\$456.00	Aug. 13, 1918

NEBRASKA-WYOMING, NORTH PLATTE PROJECT.

Vendor.	Description.	Consideration.	Date of contract.
Bowman, Newton, and Lenora Bowman.	All rights, title, and interest in the Gilmore ditch appurtenant to the N. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 23 N., R. 58 W., 6th P. M.	25 per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Gilmore ditch.	Dec. 13, 1918
Braziel, Perry, and Ida M. Braziel.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the NW. $\frac{1}{4}$ sec. 3, T. 22 N., R. 58 W., 6th P. M.	66 $\frac{2}{3}$ per cent of construction charge for Fort Laramie unit for the area in said tract irrigable from the Marsh & Braziel ditch.	Dec. 11, 1918
Do.....	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the SW. $\frac{1}{4}$ sec. 3, T. 22 N., R. 58 W., 6th P. M.	33 $\frac{1}{3}$ per cent of construction charge for Fort Laramie unit for the area in said tract irrigable from the Marsh & Braziel ditch.	Do.
Delahoyde, A. E., and Mary E. Delahoyde.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 10, T. 22 N., R. 58 W., 6th P. M.	do.....	Feb. 8, 1919
Delahoyde, Mary E., and A. E. Delahoyde.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to W. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 10, T. 22 N., R. 58 W., 6th P. M.	do.....	Do.
Foster, Charles B., and Ennis Foster.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to SE. $\frac{1}{4}$ NE. $\frac{1}{4}$, E. $\frac{1}{4}$ SE. $\frac{1}{4}$, sec. 3, and SW. $\frac{1}{4}$ NW. $\frac{1}{4}$, W. $\frac{1}{4}$ SW. $\frac{1}{4}$, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$, and NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 2, T. 22 N., R. 58 W., 6th P. M.	do.....	Dec. 11, 1918
Do.....	All rights, title, and interest in the Caldwell ditch appurtenant to the E. $\frac{1}{4}$ NE. sec. 3, W. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 2, T. 22 N., R. 58 W., 6th P. M.	50 per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Caldwell ditch.	Do.

¹ Application made June 17, 1919.

Purchases of rights and property—Continued.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Gehrt, William, and Abbie E. Gehrt.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the W. $\frac{1}{2}$ NE. $\frac{1}{4}$ sec. 3, T. 22 N., R. 58 W., 6th P. M.	66 $\frac{1}{2}$ per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Marsh & Braziel ditch.	Mar. 5, 1919
Gehrt, Jacob, and Kate Gehrt.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the W. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 3, T. 22 N., R. 58 W., 6th P. M.	33 $\frac{1}{2}$ per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Marsh & Braziel ditch.	Dec. 21, 1918
Gilmore, Dora B.	All rights, title, and interest in the Gilmore ditch appurtenant to the N. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 26, and part of the SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 23, T. 23 N., R. 58 W., 6th P. M.	25 per cent of construction charge for the Fort Laramie unit for the area in said tracts irrigable from the Gilmore ditch.	Dec. 13, 1918
Howard, William G., and Caddie Howard.	Improvements on 29.6 acres in N. $\frac{1}{2}$ sec. 34, T. 23 N., R. 62 W., 6th P. M.	\$1,038	Nov. 30, 1918
Jackson, Joel, and Rosa Jackson.	All rights, title, and interest in the Jackson extension of the State line canal appurtenant to the S. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 22, T. 23 N., R. 58 W., 6th P. M.	25 per cent of construction charge for the Fort Laramie unit for the area in said tracts irrigable from the Jackson extension.	Jan. 14, 1919
Kellums, John H., and Mattie E. Kellums.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the E. $\frac{1}{2}$ E. $\frac{1}{4}$ SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 2, and S. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 1, T. 22 N., R. 58 W., 6th P. M.	33 $\frac{1}{2}$ per cent of construction charge for the Fort Laramie unit for the area in said tracts irrigable from the Marsh & Braziel ditch.	Dec. 11, 1918
Mihan, Rose J., and John Mihan.	All rights, title, and interest in the Caldwell ditch appurtenant to the SW. $\frac{1}{4}$ sec. 33, T. 23 N., R. 58 W., 6th P. M.	50 per cent of construction charge for Fort Laramie unit for the area in said tract irrigable from the Caldwell ditch.	Do.
Ostenberg, W. H., and Minnie E. Ostenberg.	All rights, title, and interest in the Carmen ditch appurtenant to NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 34, T. 23 N., R. 60 W., 6th P. M. and NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ and lot 1, sec. 33, T. 23 N., R. 58 W., 6th P. M.	50 per cent of construction charge for Fort Laramie unit for the area in said tract irrigable from the Carmen ditch.	Jan. 2, 1919
Do.	All rights, title, and interest in the Mutual irrigating canal appurtenant to S. $\frac{1}{2}$ S. $\frac{1}{4}$ sec. 33, and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 34, T. 23 N., R. 60 W., 6th P. M.	25 per cent of construction charge for Fort Laramie unit for the area in said tract irrigable from the Mutual irrigating canal.	Do.
Remender, Fred, and Emily J. Remender.	All rights, title, and interest in the Mutual irrigating canal appurtenant to the SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 34, T. 23 N., R. 60 W., 6th P. M.	.....do.....	Dec. 12, 1918
Do.	All rights, title, and interest in the Mutual irrigating canal appurtenant to the SE. $\frac{1}{4}$ sec. 27, T. 23 N., R. 60 W., 6th P. M.	.....do.....	Do.
Thornton, Henry M., and Alice J. Thornton.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to the W. $\frac{1}{2}$ NE. $\frac{1}{4}$ E. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 2, T. 22 N., R. 58 W., 6th P. M.	33 $\frac{1}{2}$ per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Marsh & Braziel ditch.	Dec. 19, 1918
White, William, and Alice E. White, Fred L. Burns, Nan R. Burns, Charles F. Lyman, and Hazel E. Lyman.	All rights, title, and interest in the Marsh & Braziel ditch appurtenant to lots 1, 2, and 3, and SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 4, T. 22 N., R. 58 W., and SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 33, T. 23 N., R. 58 W., 6th P. M.	66 $\frac{1}{2}$ per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Marsh & Braziel ditch.	Dec. 5, 1918
Wilson, Enoch E., and Katie E. Wilson.	All rights, title, and interest in the Jackson extension of the State line ditch appurtenant to the SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 23, T. 23 N., R. 58 W., 6th P. M.	25 per cent of construction charge for Fort Laramie unit for the area in said tracts irrigable from the Jackson extension of the State line ditch.	Dec. 11, 1918

Purchases of rights and property—Continued.

NEVADA, NEWLANDS PROJECT.

Vendor.	Description.	Consideration.	Date of contract.
Davis, Jas. T. et al.	3.6 acres for lateral right of way	\$210	Apr. 12, 1919
Lamborn, J. W., and Martha J.	Two houses and lots within city limits of Fallon, Nev.	4,500	Dec. 13, 1918
Stevens, Albert N., and Lila, and Emery Pope.	1.82 acres for lateral right of way	1	Apr. 12, 1919
Williams Estate Co.	4.5 acres of land for warehouse and corrals	4,500	Feb. 20, 1919

NEW MEXICO, CARLSBAD PROJECT.

Atchison, Topeka & Santa Fe Ry. Co.	Culvert, concrete pipe; irrigation crossing and right of way.	\$673.07	June 11, 1918
Do.	Damages to bridges 166-A and 167-B, Pecos division, and release from damages and dismissal of "U. S. v. A. T. & S. F. Ry. Co., No. 500, Law," for condemnation for right of way, McMillan Reservoir.	3,858.30	May 8, 1918
Ball, Wm. E.	Damages to crops by open drain ditch D	120.50	May 15, 1918
Barnes, Charles P., and Lavina J.	do	200.00	Do.
Carter, Rich R., and Edna.	do	122.20	Do.
Fleming, A. G.; and Marie A., and Hazel.	do	75.00	Do.
Hepler, Claude, and Dakota.	do	50.00	Do.
Pardue, C. P., and Mattie.	do	225.00	Do.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT.

Andreas & Krause	Donation of 0.9 acre in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 33, T. 32 S., R. 7 E., El Paso County, Tex.	.....	Feb. 26, 1919
Apodaca, Concepcion, et ux.	Purchase of 0.70 acre in W. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 25, T. 31 S., R. 6 E., El Paso, Tex.	\$140.00	Apr. 7, 1919
Apodaca, Lorenzo, Estate Martin Frequez, administrator.	Purchase of 1.12 acres in N. W. $\frac{1}{4}$ N. W. $\frac{1}{4}$ Sec. 20, and NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	85.00	Apr. 22, 1919
Apodaca, Juan, et ux.	Purchase of 1.03 acres in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	61.80	.....
Apodaca, Anacleto	Purchase of 3.94 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 7 and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 8, T. 32 S., R. 7 E., El Paso County, Tex.	250.00	May 21, 1919
Acosta, Leopoldo	Purchase of 1.33 acres in S. $\frac{1}{4}$ NW. $\frac{1}{4}$ and SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 6, T. 32 S., R. 7 E., El Paso County, Tex.	60.00	July 5, 1918
Akers, J. B., et ux.	Purchase of 3.55 acres in NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 28, and N. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 29, T. 32 S. R. 7 E., El Paso County, Tex.	236.00	July 15, 1918
Alderete, F. G.	Donation of 0.44 acre in W. $\frac{1}{4}$ E. $\frac{1}{4}$ sec. 11, T. 32 S., R. 6 E., El Paso County, Tex.	1.00	Sept. 17, 1918
Alley, Wm. H., et ux, and John S. Alley, et ux.	Donation of 4.1 acres in E. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 2, T. 19 S., R. 4 W., Dona Ana County, N. Mex.	1.00	Jan. 5, 1918
Andreas, V. B.	Donation of 7.3 acres in N. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 11 and S. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 2 and E. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 3, T. 27 S., R. 3 E., N. M. P. M. El Paso County, Tex.	1.00	June 14, 1918
Brazito Power & Development Co.	Purchase of 2 acres in Brazito Grant, Mesquite, Dona Ana County, N. Mex.	185.00	Nov. 18, 1918
Bassett, C. N.	Donation of 2.95 acres in W. $\frac{1}{4}$ E. $\frac{1}{4}$ sec. 20, T. 32 S., R. 8 E., El Paso County, Tex.	.....	Mar. 12, 1919
Bevan, Stanley	Donation of 1.80 acres in NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	.....	Apr. 4, 1919
Bonegas, Dionicio	Donation of 2.06 acres in E. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 3, T. 23 S., R. 1 E., Dona Ana County, N. Mex.	.....	Apr. 26, 1919
Brady, J. B.	Purchase of improvements on 2 tracts of land (land donated for nominal consideration) 2.35 and 0.72 acres in sec. 31, T. 31 S., R. 7 E., El Paso County, Tex.	235.00	Dec. 12, 1918
Buckler, Margaret	Purchase of 1.53 acres in NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 6, T. 32 S., R. 7 E., El Paso County, Tex.	863.00	Dec. 10, 1918
Burrus, Louis, et ux.	Purchase of 3.57 acres in E. $\frac{1}{4}$ and NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 6, T. 32 S., R. 7 E., El Paso County, Tex.	357.00	Aug. 24, 1918
Candelaria, Felipe	Purchase of improvements (land donated for nominal consideration) on 0.73 acre in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 36, T. 31 S. R. 6 E., El Paso County, Tex.	43.80	May 21, 1918
Candelaria, Santos	Donation of 2.12 acres in N. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 19, T. 26 S., R. 3 E., Dona Ana County, N. Mex., N. M. P. M.	1.00	Nov. 26, 1918

Purchases of rights and property—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Candelaria, F. G.....	Donation of 1.47 acres in NE. $\frac{1}{4}$ sec. 11, T. 32 S., R. 6 E., El Paso County, Tex.	\$1.00	Aug. 19, 1918
Carrasco, Macario.....	Donation of 0.29 acre in NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 28, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	June 3, 1918
Chavarria, Eugenio, et ux....	Purchase of improvements (land donated for nominal consideration) on 1.03 acres in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 9, T. 19 S., R. 3 W., Dona Ana County, N. Mex., N. M. P. M.	175.00	Oct. 5, 1918
Cheek, Mrs. J. S.....	Purchase of 5.12 acres in NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 3, and SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., El Paso County, Tex.	212.00	June 25, 1918
Clapp, Ida B.....	Donation of 0.4 acre in S. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 34, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 10, 1918
Clifford, James.....	Donation of 1.39 acres in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 25, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 23, 1918
Cobas, Refugio A. de.....	Donation of 0.78 acre in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 25, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 22, 1918
Coffin, C. O.....	Donation of 2.23 acres in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 15, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	May 31, 1918
Do.....	Donation of 5.41 acres in NE. $\frac{1}{4}$ sec. 14 and S. $\frac{1}{4}$ sec. 11, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	Mar. 27, 1918
Cooley, W.....	Donation of 3 tracts of 0.6, 4.2, and 4.6 acres, respectively, in E. $\frac{1}{4}$ sec. 34, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Mar. 29, 1919
Critchett, J. C.....	Purchase of 2.6 acres in SE. $\frac{1}{4}$ sec. 35, T. 32 S., R. 7 E., El Paso County, Tex.	418.60	July 15, 1918
Critchett, J. F., et al.....	Purchase of 5.14 acres in SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 33, T. 32 S., R. 7 E., El Paso County, Tex.	205.60	Oct. 10, 1918
Campbell, P. F., et al.....	Donation of 0.0016 acre in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 7, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	.....	Oct. 4, 1918
Campbell, P. F., et ux.....	Donation of 2.76 acres in NE. $\frac{1}{4}$ sec. 7, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	.....	Do.
Do.....	Purchase of improvements (land donated for nominal consideration) on 1.74 acres in NE. $\frac{1}{4}$ sec. 7, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	104.40	Do.
Charles, L. J.....	Purchase of improvements (land donated for nominal consideration) on .94 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ and W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 30, T. 17 S., R. 4 W., Sierra County, N. Mex.	404.83	May 10, 1919
Coffin, C. O.....	Donation of 0.35 acre in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 11, T. 33 S., R. 7 E., El Paso County, Tex.	.....	Mar. 31, 1919
Cordoro, Juan.....	Donation of 2.99 acres in SE. $\frac{1}{4}$ sec. 1, T. 34 S., R. 7 E., El Paso County, Tex.	.....	Mar. 4, 1919
Clapp, Lafayette.....	O. & M. camp site purchase, Hatch, N. Mex.	285.00	Feb. 14, 1919
Davis, Waters.....	Purchase of 1.34 acres in SE. $\frac{1}{4}$ sec. 10 and SW. $\frac{1}{4}$ sec. 11, T. 33 S., R. 7 E., El Paso County, Tex.	87.10	Aug. 19, 1918
Dyer, John L.....	Donation of 0.36 acre in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 14, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	July 15, 1918
Dyer, John L., et al.....	Donation of 0.41 acre in SE. $\frac{1}{4}$ sec. 15, T. 33 S., R. 7 S., El Paso County, Tex.	1.00	July 18, 1918
Davis, Chas.....	Donation of 1.51 acres and 2.79 acres in SE. $\frac{1}{4}$ sec. 25, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Dec. 13, 1918
Dorbant, Robert L.....	Donation of 6 tracts of land, Dona Ana County, N. Mex.: 8.49 acres, N. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 11, T. 19 S., R. 3 W.; 2.26 acres, SE. $\frac{1}{4}$ sec. 11, NE. $\frac{1}{4}$ sec. 14, NW. $\frac{1}{4}$ sec. 13, T. 19 S., R. 3 W.; 2.14 acres, E. $\frac{1}{4}$ sec. 11, T. 19 S., R. 3 W.; 6.65 acres, SW. $\frac{1}{4}$ sec. 12, T. 19 S., R. 3 W.; 5.35 acres, NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 18, T. 19 S., R. 2 W.; 0.24 acre, NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 18, T. 19 S., R. 2 W.	.....	Nov. 20, 1918
Dyer, John L.....	Donation 0.36 acre in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 14, T. 33 S., R. 7 E., El Paso County, Tex.	.....	Feb. 13, 1919
Elliott, L. F.....	Purchase of improvements (land donated for nominal consideration) on 1.13 acres in SW. $\frac{1}{4}$ sec. 10, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	50.00	Nov. 22, 1918
Eubank, J. W.....	Donation of 0.5 acre in W. $\frac{1}{4}$ NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	May 31, 1918
Do.....	Donation of 1.32 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 23, and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 23 and NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 25, T. 31 S., R. 6 E., El Paso County, Tex.	1.00	Sept. 9, 1918
Fajardo, Geronimo, et ux.....	Purchase of improvements (land donated for nominal consideration) on 0.50 acre in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 9, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	30.00	Oct. 4, 1918

Purchases of rights and property—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
First National Bank of El Paso, Tex.	Donation of 2.75 acres in N. $\frac{1}{2}$ NE. $\frac{1}{4}$ sec. 8, S. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 5, T. 32 S., R. 7 E., El Paso County, Tex.	\$1.00	Aug. 5, 1918
Folx, L. A.	Donation of 0.16 acre in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 15, T. 31 S., R. 6 E., El Paso County, Tex.	1.00	July 21, 1918
Ford, J. J.	Donation of 6.10 acres in W. $\frac{1}{2}$ SW. $\frac{1}{4}$ sec. 27, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Nov. 1, 1918
Freudenthal, P. H.	Donation of 1.53 acres in NW. $\frac{1}{4}$ sec. 17 and 0.72 acre in NW. $\frac{1}{4}$ sec. 17, T. 24 S., R. 2 E., Dona Ana County, N. Mex.	1.00	May 17, 1918
Flores, Cresencio, et al.	Donation of 0.20 acre in SE. $\frac{1}{4}$ sec. 1, T. 34 S., R. 7 E., El Paso County, Tex.	.....	Mar. 10, 1919
Fox, Eugene.	Donation of 0.35 acre in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 36, T. 25 S., R. 2 E., Dona Ana County, N. Mex.	.....	June 11, 1918
Fresques, Martin, et ux.	Purchase of 1.07 acres in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	64.20	May 20, 1919
Frey, Flora L.	Purchase of improvements (land donated for nominal consideration) on 1.47 acres in NE. $\frac{1}{4}$ sec. 27 and SE. $\frac{1}{4}$ sec. 22, T. 27 S., R. 3 E., El Paso County, Tex.	90.00	Feb. 19, 1919
Frist Ranch Co.	Donation of 3.59 acres in S. $\frac{1}{2}$ N. $\frac{1}{2}$ sec. 20, T. 33 S., R. 8 E., El Paso County, Tex.	.....	Mar. 12, 1919
Gaal, I. G.	Purchase of 3.43 and 7.49 acres in secs. 32 and 29, T. 33 S., R. 8 E., El Paso County, Tex.	738.00	Jan. 4, 1919
Gamlochipi, Juana C.	Donation of 1.27 acres in NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 29, T. 32 S., R. 7 E., El Paso County, Tex.	.....	Mar. 18, 1918
Garcia, G. N.	Purchase of 3.54 acres in N. $\frac{1}{2}$ SW. $\frac{1}{4}$ and SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 33, T. 32 S., R. 7 E., El Paso County, Tex.	209.40	Dec. 28, 1918
Giron, Tomosa G.	Purchase of 2.64 acres in E. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 22, T. 33 S., R. 7 E., El Paso County, Tex.	30.60	Mar. 1, 1919
Gooch, K. A.	Donation of 1.12 acres in NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 23, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Apr. 2, 1919
Garcia, F. B.	Donation of 0.463 acre in NW. $\frac{1}{4}$ sec. 5, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	July 17, 1918
Giddings, Edith.	Donation of 1.12 acres in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 20, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	June 24, 1918
Gillette, J. A., et ux.	Purchase of improvements (land donated for nominal consideration) on 0.71 acre in SE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 26, T. 31 S., R. 6 E., El Paso County, Tex.	80.00	June 4, 1918
Giron, Tomosa G.	Donation of 0.43 acre in NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 34, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Nov. 1, 1918
Grand View Realty Co.	Donation of 3.97 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 5 and SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 6, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 12, 1918
Hardie, Robert, et ux.	Purchase of 2 tracts of 1.84 and 1.77 acres, respectively, in N. $\frac{1}{2}$ SE. $\frac{1}{4}$ and E. $\frac{1}{2}$ sec. 29, T. 32 S., R. 7 E., El Paso County, Tex.	239.65	Dec. 19, 1918
Hood, Norwood.	Purchase of 2.53 acres in SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 29, T. 32 S., R. 7 E., El Paso County, Tex.	167.25	Dec. 20, 1918
Hall, Jas. T.	Donation of 4.94 acres in NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ and NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 15 and SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 10, T. 27 S., R. 3 E., El Paso County, Tex.	1.00	Sept. 5, 1918
Hood, Norwood.	Donation of 0.6 acre in N. $\frac{1}{2}$ NE. $\frac{1}{4}$ sec. 29, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 22, 1918
Hudspeth, C. B.	Donation of 2.07 acres in W. $\frac{1}{2}$ SE. $\frac{1}{4}$ and NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 5, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 13, 1918
Huffman, G. W.	Donation of 0.465 acre in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Nov. 1, 1918
Holguin, Guadalupe.	Purchase of 0.66 acre in W. $\frac{1}{2}$ W. $\frac{1}{2}$ sec. 20, T. 32 S., R. 7 E., El Paso County, Tex.	40.00	Mar. 15, 1919
Hoy, J. M., et ux.	Donation of 4.85 acres in NW. $\frac{1}{4}$ sec. 18, T. 19 S., R. 2 W., Dona Ana County, N. Mex.	.....	Dec. 9, 1918
Hughes, John R.	Donation of 0.55 acre in W. $\frac{1}{2}$ SW. $\frac{1}{4}$ sec. 30, T. 31 S., R. 7 E., El Paso County, Tex.	.....	Mar. 4, 1919
Huffman, G. W.	Donation of 0.465 acre in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	.....	Nov. 1, 1918
Jakobsen, B. F., et ux.	Purchase of 0.78 acre in E. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 4, T. 25 S., R. 2 E., Dona Ana County, N. Mex.	125.00	Apr. 14, 1919
Johnson, J. W.	Purchase of 1.64 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 31, T. 31 S., R. 7 E., El Paso County, Tex.	200.00	Apr. 12, 1919
Jurado, Miguel, et ux.	Purchase of 1.74 acres in SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 18, T. 32 S., R. 7 E., El Paso County, Tex.	174.00	Mar. 15, 1919
Jaramillo, Francisco, et ux.	Purchase of improvements (land donated for nominal consideration) on 3.02 acres in W. $\frac{1}{2}$ SE. $\frac{1}{4}$ sec. 10, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	216.20	Oct. 3, 1918

Purchases of rights and property—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Jaramillo, Lorenzo, et ux.....	Purchase of 1.39 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 10 and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 11, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	\$83.40	Apr. 26, 1918
Jaramillo, Perfecto.....	Purchase of 3.19 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 10, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	192.00	Do.
Jones, Walter H.....	Donation of 9.1 acres in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ and N. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 12, T. 19 S., R. 4 W., Dona Ana County, N. Mex.	1.00	Feb. 27, 1918
Kidd, John W.....	Donation of 1.1 acres in S. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Apr. 29, 1918
Kerbey, M. M.....	Donation of 1.38 acres in NW. $\frac{1}{4}$ sec. 24, T. 28 S., R. 3 E., El Paso County, Tex.	.....	Mar. 28, 1918
Krakauer, Mrs. Ada.....	Donation of 2.35 acres in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 19, and SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 20, T. 33 S., R. 8 E., El Paso County, Tex.	.....	Mar. 23, 1919
Lawrence, E. M., Jr.....	Donation of 2.22 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 1, NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 12, T. 34 S., R. 7 E., El Paso County, Tex.	.....	Mar. 12, 1919
Do.....	Donation 1.43 acres in N. $\frac{1}{4}$ N. $\frac{1}{4}$ sec. 7, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 6, T. 34 S., R. 8 E., El Paso County, Tex.	.....	Do.
Leavell, C. H.....	Purchase of 3.17 acres in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 29, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 20, T. 32 S., R. 7 E., El Paso County, Tex.	237.75	Feb. 5, 1919
Luce, H. A.....	Donation of 1.93 acres in W. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 25, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Dec. 9, 1918
Lange, Edw., et ux.....	Purchase of improvements on 3.46 acres in NW. $\frac{1}{4}$ sec. 19, T. 26 S., R. 3 E., Dona Ana County, N. Mex.	259.50	Jan. 12, 1919
Lanier, J. S.....	Purchase of 21.45 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 10, and E. $\frac{1}{4}$ E. $\frac{1}{4}$ sec. 15 and E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 22, T. 33 S., R. 7 E., El Paso County, Tex.	1,009.70	Aug. 3, 1918
Do.....	Purchase of 5.19 acres in SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 15, and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 14 and NW. $\frac{1}{4}$ sec. 23, T. 33 S., R. 7 E., El Paso County, Tex.	259.50	Oct. 10, 1918
Lochhausen, E. O., et ux.....	Donation of 6.15 acres in N. $\frac{1}{4}$ SW. $\frac{1}{4}$ and SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 5, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 5, 1918
Loomis, Chas. R.....	Donation of 6.26 acres in NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ and S. $\frac{1}{4}$ NE. $\frac{1}{4}$ and NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 22, T. 27 S., R. 3 E., El Paso County, Tex.	1.00	Aug. 22, 1918
Do.....	Donation of 2.25 acres in NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 34 and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 27, T. 27 S., R. 3 E., El Paso County, Tex.	1.00	July 24, 1918
Do.....	Donation of 2.28 acres in W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 30, T. 33 S., R. 8 E., El Paso County, Tex.	1.00	Oct. 22, 1918
Lozano, Jose.....	Purchase of improvements (land donated for nominal consideration) on 0.94 acre in SW. $\frac{1}{4}$ sec. 31, T. 31 S., R. 7 E., and NW. $\frac{1}{4}$ sec. 6, T. 32 S., R. 7 E., El Paso County, Tex.	56.40	May 21, 1918
Molntyre, E. E., et ux.....	Donation of 7.1 acres in N. $\frac{1}{4}$ SW. $\frac{1}{4}$ and NW. $\frac{1}{4}$ sec. 2, T. 28 S., R. 3 E., El Paso County, Tex.	1.00	May 3, 1918
Martin, Isabelle.....	Purchase of 4.32 acres in SW. $\frac{1}{4}$ sec. 2, T. 28 S., R. 3 E., El Paso County, Tex.	108.00	Aug. 19, 1918
Martinez, Andreas.....	Purchase of 0.295 acre in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 5, T. 33 S., R. 7 E., El Paso County, Tex.	32.72	July 17, 1918
Metcalf, DeF., et ux.....	Donation of 0.588 acre in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	June 24, 1918
Moon, Wm.....	Purchase of 1.85 acres in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 7, T. 32 S., R. 7 E., El Paso County, Tex.	128.00	Aug. 1, 1918
Do.....	Donation of 0.35 acre in NW. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Do.
Morgan, Robert.....	Donation of 0.65 acre in SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 11, T. 32 S., R. 6 E., El Paso County, Tex.	1.00	Aug. 26, 1918
Mullen, J. F.....	Donation of 4.9 acres in SE. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., and SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	July 2, 1918
Mundy, J. J.....	Donation of 8.18 acres in N. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 2, T. 28 S., R. 3 E., and W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 35, T. 27 S., R. 3 E., El Paso County, Tex.	1.00	May 18, 1918
Madrid, M. Y.....	Purchase of improvements (land donated for nominal consideration) on 1.37 acres in E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 32, T. 32 S., R. 7 E., El Paso County, Tex.	900.00	Dec. 19, 1918
Martinez, Pedro, et ux.....	Purchase of improvements (land donated for nominal consideration) on 2.61 acres in N. $\frac{1}{4}$ sec. 8, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	275.00	Nov. 22, 1918
Merten, Geo. H.....	Donation of 0.06 acre in NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 9, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	.....	Oct. , 1918

Purchases of rights and property—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Mitchell, Annie E., et al.....	Purchase of improvements (land donated for nominal consideration) on 6.23 acres in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ and S. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 3, T. 27 S., R. 3 E., El Paso County, Tex.	\$400.00	Nov. 30, 1918
Moon, Wm.....	Purchase of 0.61 acre in SW. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	76.00	May 1, 1919
Morlock & Guenther.....	Donation of 3.39 acres in SW. $\frac{1}{4}$ sec. 7 and 0.46 acre in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 7, T. 19 S., R. 2 W., Dona Ana County, N. Mex.	.....	Feb. 1, 1919
Mundy, J. J., and Clara Fink.....	Donation of 16.89 acres in E. $\frac{1}{4}$ sec. 22, NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 22, and SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 15, T. 25 S., R. 2 E., Dona Ana County, N. Mex.	.....	Dec. 30, 1918
McIntosh, E. D., et ux.....	Donation of 5.72 acres in SE. $\frac{1}{4}$ NW. $\frac{1}{4}$ and NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 3, T. 23 S., R. 1 E., Dona Ana County, N. Mex.	.....	Apr. 22, 1919
Newman, C. M., et al.....	Donation of 0.90 acre in SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 31, T. 33 S., R. 8 E., El Paso County, Tex.	.....	Oct. 12, 1918
Neshitt, W. H., et ux.....	Purchase of 1.97 acres in SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 28, T. 26 S., R. 3 E., Dona Ana County, N. Mex.	344.75	May 21, 1919
Newman, C. M.....	Donation of 1.53 acres in NE. $\frac{1}{4}$ sec. 13, T. 32 S., R. 6 E., El Paso County, Tex.	1.00	Apr. 29, 1918
Newman, Tom B., et al.....	Donation of 2.43 acres in SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 22, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	June 15, 1918
Norman, S. J., et ux.....	Purchase of 1.15 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ and N. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 9, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	216.00	Aug. 10, 1918
Otero, L. J.....	Purchase of improvements on 2.2 acres in SE. $\frac{1}{4}$ NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ and NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 8, T. 18 S., R. 4 W., Dona Ana County, N. Mex.	75.45	Oct. 23, 1918
O'Dell, Mrs. Hollie B., et vir..	Donations of 2.61 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 27 and SE. $\frac{1}{4}$ sec. 28, T. 32 S., R. 7 E., El Paso County, Tex.	.....	Jan. 14, 1919
Padilla, Abel V.....	Purchase of 1.13 acres in W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 19, T. 32 S., R. 7 E., El Paso County, Tex.	125.00	Feb. 26, 1919
Prati, Joe, et ux.....	Purchase of 1.04 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 5, T. 32 S., R. 7 E., El Paso County, Tex.	114.00	Jan. 17, 1919
Provando, Pascual.....	Purchase of 0.89 acre in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 18, T. 32 S., R. 7 E., El Paso County, Tex.	125.00	Mar. 15, 1919
Padilla, Juan.....	Donation of 2.69 acres in E. $\frac{1}{4}$ sec. 13, T. 32 S., R. 6 E., El Paso County, Tex.	1.00	June 3, 1918
Robinson, Hallie B.....	Purchase of 1.42 acre in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 16, T. 32 S., R. 7 E., El Paso County, Tex.	75.00	July 20, 1918
Ruiz, Erminio.....	Donation of 1.55 acres in E. $\frac{1}{4}$ E. $\frac{1}{4}$ sec. 25, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 22, 1918
Rodriguez, Yldifonso.....	Purchase of improvements (land donated for nominal consideration) on 1.32 acres in NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 9 and NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 10, T. 19 S., R. 3 W., Dona Ana County, N. Mex.	100.00	Oct. 3, 1918
Salcido, Blasa, et vir.....	Purchase of improvements on 0.25 acre in SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 1, T. 10 S., R. 4 W., Dona Ana County, N. Mex.	35.00	May 31, 1919
Sarrels, Z. W.....	Purchase of 0.91 acre in NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 28, T. 32 S., R. 7 E., El Paso County, Tex.	47.60	Apr. 30, 1919
Schalrer, J. J.....	Purchase of 4.62 acres in SE. $\frac{1}{4}$ NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ and NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 17, T. 32 S., R. 7 E., El Paso County, Tex.	560.00	Apr. 7, 1919
Schriner, Emily, et vir.....	Purchase of improvements on 5.01 acres in SW. $\frac{1}{4}$ sec. 30, T. 17 S., R. 4 W., Sierra County, N. Mex.	75.00	Feb. 11, 1919
Smith, J. J.....	Donation of 0.19 acre in NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Dec. 31, 1918
Do.....	Donation of 5.05 acres in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ and E. $\frac{1}{4}$ sec. 22, and NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Feb. 1, 1919
Do.....	Donation of 0.29 acre in NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 31 S., R. 6 E., El Paso County, Tex.	.....	Dec. 31, 1918
Stahmann, W. J.....	Purchase of improvements (land donated for nominal consideration) on 1.04 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 34, T. 32 S., R. 7 E., El Paso County, Tex.	83.20	Dec. 12, 1918
Schildknecht & Daugherty...	Purchase of 3.05 acres in W. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 16, T. 32 S., R. 7 E., El Paso County, Tex.	152.50	Sept. 23, 1918
Do.....	Purchase of 2.58 acres in NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 19, and SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 18, T. 32 S., R. 7 E., El Paso County, Tex.	60.50	Sept. 21, 1918
Schutz, H. H.....	Donation of 0.19 acre in N. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 28, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 25, 1918
Security Mortgage & Cattle Loan Co.	Donation of 1.71 acres in W. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 22, T. 27 S., R. 3 E., El Paso County, Tex.	1.00	Oct. 25, 1918

Purchases of rights and property—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Sherwood, H. J., et ux.....	Donation of 1.66 acres in W. $\frac{1}{2}$ sec. 31, T. 33 S., R. 8 E., El Paso County, Tex.	\$1.00	Oct. 24, 1918
Socorro Farms Co.....	Donation of 1.40 acres in NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 8, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Oct. 12, 1918
Stallings, L. L., et ux.....	Purchase of 3.45 acres in SW. $\frac{1}{4}$ BE. $\frac{1}{4}$ sec. 5, T. 32 S., R. 7 E., El Paso County, Tex.	431.45	Aug. 14, 1918
Stevens, Chas. B.....	Donation of 7.83 acres in NW. $\frac{1}{4}$ sec. 34 and S. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 27, T. 32 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 28, 1918
Telles, Juan M.....	Donation of 0.178 acre in NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 5, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	July 24, 1918
Thompson, L. R.....	Purchase of 5.50 acres in W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 34, and E. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 33 and S. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 33, T. 32 S., R. 7 E., El Paso County, Tex.	589.60	Oct. 8, 1918
Urtiaga, Josefa.....	Purchase of 0.75 acre in S. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 18, T. 32 S., R. 7 E., El Paso County, Tex.	75.00	Mar. 15, 1919
Vinyard, Anna.....	Purchase of 2.14 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ and N. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 8, T. 32 S., R. 7 E., El Paso County, Tex.	180.50	July 24, 1918
Wadlington, J. Y., et ux, and J. C. Oden.	Purchase of improvements (land donated for nominal consideration) on 2.79 acres in W. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 15, and E. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 16, T. 32 S., R. 7 E., El Paso County, Tex.	111.60	May 27, 1918
White, Z. T., and Ramirez, Lorenzo.	Purchase of improvements (land donated for nominal consideration) on 9.31 acres in E. $\frac{1}{4}$ sec. 25, T. 28 S., R. 3 E., and NW. $\frac{1}{4}$ sec. 31, T. 28 S., R. 4 E., El Paso County, Tex.	60.00	Oct. 21, 1918
Womack, J. Y.....	Donation of 5.96 acres in W. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., El Paso County, Tex.	1.00	Sept. 25, 1918
Wright, M. O.....	Donation of 1.75 acres in NW. $\frac{1}{4}$ sec. 13, T. 32 S., R. 6 E., El Paso County, Tex.	1.00	Apr. 30, 1918
Webb, M. H.....	Purchase of 0.83 acre in NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 30, T. 33 S., R. 8 E., El Paso County, Tex.	110.00	Feb. 28, 1919
Wilmarth, J. C.....	Donation of 1.28 acres in SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 6, T. 34 S., R. 8 E., El Paso County, Tex.	.....	Mar. 10, 1919
Winder, C. D.....	Donation of 1.20 acres in N. $\frac{1}{4}$ sec. 1, T. 34 S., R. 7 E., El Paso County, Tex.	.....	Mar. 24, 1919
Womack, J. Y.....	Donation of 5.96 acres in W. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 3, T. 33 S., R. 7 E., El Paso County, Tex.	.....	Sept. 25, 1918
Borrego, Elijah, et ux.....	Purchase of 1.79 acres in SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 33, and SE. $\frac{1}{4}$ sec. 32, T. 32 S., R. 7 E., El Paso County, Tex.	143.20	Nov. 5, 1918
Provencio, Adelaido.....	Purchase of 4.01 acres in E. $\frac{1}{4}$ sec. 11, T. 24 S., R. 1 E., Dona Ana County, N. Mex.	120.30	Nov. 7, 1918
Provencio, E., estate.....	Purchase of 6.37 acres in N. $\frac{1}{4}$ and NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 11, T. 24 S., R. 1 E., Dona Ana County, N. Mex.	191.10	Do.
COMMUNITY DITCHES.			
Daugherty community ditch..	El Paso County, Tex. (donation deed in connection with petition for operation by Reclamation Service).	.....	Nov. 11, 1918
Garfield community ditch....	Dona Ana and Sierra Counties, N. Mex. (donation deed in connection with petition for operation by Reclamation Service).	.....	Mar. 15, 1919
Jornado community ditch....	El Paso County, Tex. (donation deed in connection with petition for operation by Reclamation Service).	.....	Dec. 19, 1918

OREGON-CALIFORNIA, KLAMATH PROJECT.

Bagby, Christina, et vir.....	Part NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 16, T. 39 S., R. 9 E., W. M.	\$1.00	June 16, 1919
Halousek, Frank J., et ux....	Part SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 23 and NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 24, T. 41 S., R. 12 E., W. M.	1.00	May 4, 1918
Kilham, Mother Mary, trustee.	Part N. $\frac{1}{4}$ sec. 16, T. 39 S., R. 9 E., W. M.	1.00	May 3, 1919
Klamath Lake Land & Livestock Co.	Part SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 23 and NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 24, T. 41 S., R. 12 E., W. M.	1.00	Aug. 1, 1918
Lang, Ernest G., et ux.....	Part SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 22, T. 39 S., R. 9 E., W. M.	1.00	Aug. 28, 1918
Maddox, J. A., et al.....	Part lot 6 sec. 27, T. 40 S., R. 10 E., W. M.	1.00	June 5, 1919
Mason, Grace, et vir.....	Part NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ and NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 27, T. 39 S., R. 9 E., W. M.	1.00	July 31, 1918
Melhase, Henrietta F. (widow)	Part SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 29, T. 39 S., R. 9 E., W. M.	70.00	Oct. 28, 1918
Miller, Sarah (widow).....	Part NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 16, T. 39 S., R. 9 E., W. M.	1.00	Apr. 23, 1919
Moe, H. N., et al.....	Part NE. $\frac{1}{4}$ NW. $\frac{1}{4}$ and NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 39 S., R. 9 E., W. M.	1.00	May 13, 1919

Purchases of rights and property—Continued.

OREGON-CALIFORNIA, KALMATH PROJECT—Continued.

Vendor.	Description.	Consideration.	Date of contract.
Moore, R. S., et al.....	Part NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 27, T. 39 S., R. 9 E., W. M.	\$1.00	June 20, 1918
Petrasek, Fred, et al.....	Part NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 15, T. 41 S., R. 12 E., W. M.	1.00	Sept. 4, 1918
Pope, Dora O., et vir.....	Part NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ and lot 7 sec. 12, T. 41 S., R. 10 E., W. M.	1.00	June 9, 1919
Thompson, J. A., et ux.....	Part E. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 8, T. 40 S., R. 9 E., W. M...	1.00	July 13, 1918

UTAH, STRAWBERRY VALLEY PROJECT.

Martin, George H.....	Right of way for lateral 30 acres west half of NE. $\frac{1}{4}$ of sec. 23, T. 9 S., R. 1 E., S. L. B. & M., 6.63 acres.	\$132.00	Jan. 14, 1919
Snow, Edwin M.....	Right of way across NE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ sec. 27, T. 8 S., R. 3 E., S. L. B. & M., Mapleton lateral, area 4.85 acres; improvements only.	189.00	June 17, 1919
Starr, Courtland A.....	Right of way across west half of SW. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of sec. 11, T. 8 S., R. 3 E., S. L. B. & M., Mapleton lateral, area 0.72 acres; fee title.	72.00	June 21, 1919

WASHINGTON, OKANOGAN PROJECT.

McDaniel, Wm. M.....	Lot 8, sec. 6, lots 3, 4, 5, 6, 7, 8, sec. 5, T. 35 N., R. 25 E., W. M.	\$3,000.00	Pending.
Osoyoos Co.....	Lots 27, 28, block T, of Conconully Mining Co.'s addition to town of Conconully, Wash.	75.00	Do.
Putnam, Frank, et ux.....	Lots 1 and 2, block T, of Conconully Mining Co.'s addition to town of Conconully, Wash.	200.00	Do.
Segle, Mary E.....	Lots 25, 26, 27, 28, block U, of Conconully Mining Co.'s addition to town of Conconully, Wash.	125.00	Do.

MONTANA, FORT PECK (INDIAN) PROJECT.

Sear, Francis.....	An easement over a portion of the SW. $\frac{1}{4}$ of NW. $\frac{1}{4}$ of sec. 33, T. 28 N., R. 51 E.	\$125.00	July 22, 1918
--------------------	---	----------	---------------

WYOMING, RIVERTON (INDIAN) PROJECT.

Connaghan, Catharine.....	Lots 1, 2, and 3, block 5, R. J. Burch's first addition to Riverton.	\$1,175.00	Apr. 23, 1919
Gregg, Jean S.....	SW. $\frac{1}{4}$ of SW. $\frac{1}{4}$ of sec. 13, lot 1, sec. 23, and N. $\frac{1}{4}$ of NW. $\frac{1}{4}$ of sec. 24, T. 3 N., R. 2 W., W. R. M.	1,500.00	Do.
Hoopengartner, Ross, and Betty.	33.79 acres in lot 7 and 21.73 acres in NW. $\frac{1}{4}$ of SE. $\frac{1}{4}$ of sec. 23, T. 3 N., R. 2 W., W. R. M.	4,164.00	Mar. 22, 1919

PRINCIPAL CURRENT CONTRACTS.

In the following tables are shown, by projects, data relative to the principal contracts in operation or completed during the fiscal year ending June 30, 1919:

Principal current contracts.

ARIZONA-CALIFORNIA, YUMA PROJECT.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
420	1915. July 21	Yuma Mesa Irrigation Co.	Supplying water for irrigation purposes.	.....	.....	(1)
445	1916. Dec. 23	Continental Securities Co.	.....do.....	.....	.....	(1)
511	1918. Feb. 16	Imperial Irrigation District.	Preliminary survey for All-American Canal into Imperial Valley.	\$45,000.00	\$45,000.00	
537	July 1	Laura A. Elder.....	Rock from quarry for levee revetment.	5,000.00	5,000.00	1919. June 30
532	Oct. 1	North Gila Irrigation District.	Transfer of operation of irrigation system from Government to district.	.....	.....	1938. Sept. 24
558	Oct. 23	Imperial Irrigation District.	Construction of All-American Canal into Imperial Valley from Laguna Dam.	.....	.....	(2)
* 551	1919. May 6	Yuma Mesa Irrigation Co.	Water for irrigation.....	.....	.....	(2)

COLORADO, GRAND VALLEY PROJECT.

803	1918. Sept. 10	S. Morgan Smith Co.	Direct pumping unit, Price-Stub plant, and spare parts.	\$15,585.00	\$15,585.00	(3)
805	Oct. 15	Monaghan Machine Co.	Drag-line excavator.....	24,300.00	24,300.00	(3)

IDAHO, BOISE PROJECT.

	1919. Feb. 5	Idaho Construction Co.	Earthwork, Notus Canal.....	\$19,426.00	\$17,345.76	1919. Aug. 20
	Jan. 23	S. C. Comerford.....	.....do.....	40,000.00	41,761.36	Do.

IDAHO, KING HILL PROJECT.

1	1918. Sept. 10	Reynolds-Ely Construction Co.	Excavation, main canal station 93 to station 105+51.	\$25,940.00	\$27,201.08	1919. Feb. 25
	Dec. 12	The Vulcan Iron Works Co.	Gates, guides, and stands....	1,094.00	1,094.00	Mar. 1
	July 26	King Hill Irrigation District.	Repairs, Deer Gulch flume...	5,000.00	6,697.69	
	Oct. 17	Western Pipe & Steel Co.	Steel elbows and thimbles, Big Pilgrim siphon.	2,985.00	2,985.00	1918. Nov. 15
	Sept. 16	Continental Pipe Manufacturing Co.	Wood staves for Big Pilgrim siphon.	11,272.22	11,272.22	Nov. 10

¹ Upon completion of United States plant to irrigate same area.

² Effective when ratified by a vote of the people of Imperial Irrigation District.

³ Supplementing No. 420.

⁴ Upon completion of Government plant.

⁵ Completed.

Principal current contracts—Continued.

MONTANA, MILK RIVER PROJECT.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
6	1918. June 26	Andrew Johnson....	Backfill of Cow Creek waste-way.	\$425.00	\$391.00	1918. Aug. 26
7	July 16	Booth & Knipe.....	Excavation lateral N8-116 extension.	700.00	943.00	Aug. 5
8	Sept. 24	Jas. O'Connor and Samuel O'Connor.	Repairs to upper Peoples Creek dike.	1,050.00	479.28	Dec. 8
9	Nov. 6	Jas. O'Connor.....	Milk River cut-off, Point of Rocks.	360.00	354.00	Dec. 6
	June 20	Weston & Facy.....	33 miles telephone line, Nelson Reservoir to Beaverton, and Paisley to Willow Creek.	2,753.50	2,782.49	Oct. 15
2374	1919. Jan. 14	H. C. Huber.....	Test borings for Chain Lakes Dams.	.....	1,270.00	1919. May 9
2363	Feb. 2	B. M. Williams.....	.....do.....	.....	1,433.50	May 17

MONTANA, SUN RIVER PROJECT.

	1913. Feb. 19 Sept. 15	Great Falls Power Co. West Coast Construction Co. and Hans Pederson.	Electrical energy..... Structures, Greenfields, first unit.	\$30,000.00 68,500.00	\$21,410.70 17,714.55	1919. Sept. 29 (¹)
	1916. Oct. 16	Erickson & Fransen..	Completion of above.....	.....	10,332.46	(²)
	1917. Sept. 29	Completion by United States of above.	.....do.....	.....	40,797.89	1918. Dec. —
	1919. Mar. 29	Chapman & Wilkinson.	Erection of buildings at Fairfield.	2,000.59	1,396.59	1919. July 2

NEBRASKA-WYOMING, NORTH PLATTE PROJECT.

735	1916. Oct. 19	Winston Bros. Co...	Earthwork and structures, schedules 1 to 7, specification 348.	\$270,061.00	\$289,450.08	1918. Nov. 28
752	1917. Apr. 18	MacArthur Bros. Co.	Earthwork, division 5, Fort Laramie Canal, schedule 5, specification 357, and structures divisions 1 to 4, Fort Laramie Canal, schedule 7, specification 357.	213,967.25	\$244,761.58	Dec. 30
753	Apr. 19	Winston Bros. Co...	Earthwork and structures, division 5, Fort Laramie Canal, schedules 1, 2, 3, 4, 6, and 7, specification 357.	217,845.00	\$244,277.16	1919. Feb. 28
773	July 17	J. E. Hilton.....	Earthwork, division 6, Fort Laramie Canal, schedule 1, specification 367.	53,410.00	\$ 59,061.25	1918. Nov. 30
342-F	Sept. 27	J. L. Hamp.....	Earthwork, lateral division 1, Fort Laramie Unit, schedules 12 and 13.	3,362.50	\$ 3,440.70	Nov. 28
787	Dec. 4	Monighan Machinery Co.	2 1 T gasoline walking drag lines, specification 111-D.	21,140.00	\$ 22,363.32	
790	1918. Jan. 24	Wm. L. Connelly...	Earthwork, Cherry Creek lateral, Fort Laramie unit, specification 373.	45,135.00	\$ 47,190.30	1919. Apr. 15
789	Jan. 29	Trump Manufacturing Co.	Turbines for Lingle power plant, specification 121-D.	9,730.00	\$ 9,730.00	
781	Feb. 2	Allis-Chalmers Co...	Generators for Lingle plant, specification 121-D.	7,760.00	\$ 7,760.00	1918. July 8

¹ Suspended Sept. 18, 1916.

² Suspended Sept. 23, 1917.

³ Completed.

Principal current contracts—Continued.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT—Continued.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
797	1918. Feb. 12	Westinghouse Electric & Manufacturing Co.	Switchboard equipment, Lingle power plant, specification 121-D.	\$3,415.00	¹ \$3,415.00	1919. July 13
793	Feb. 26	Bucyrus Co.	3 electric drag-line excavators, specification 375.	78,075.00	¹ 81,918.92	
794	...do....	General Electric Co.	Transformers, Lingle power plant, specification 122-D.	10,650.00	¹ 12,900.00	
500-F	Mar. 12	J. C. Hinds	Earthwork, lateral division 2, Fort Laramie unit, schedules 2 and 3.	4,100.00	¹ 4,129.40	1919. Jan. 31
	Mar. 20	The R. Hardesty Mfg. Co.	Gates, schedule 1, specification 141-D.	769.09	¹ 769.09	
601-F	Apr. 6	J. C. Hinds	Earthwork, lateral division 2, Fort Laramie unit, schedules 4 and 5.	3,901.50	¹ 3,565.82	Jan. 31
505-F	May 6	Price Bros.	Earthwork, lateral division 1, Fort Laramie unit, specification 506-F.	2,000.00	¹ 2,243.78	1918. Sept. 1
799	May 14	J. E. Hilton	Earthwork, core banks and overhaul, division 7, Fort Laramie Canal, specification 377.	79,440.00	79,132.83	1919. July 1
801	June 10	Pacific Tank & Pipe Co.	Wooden stave penstock for Lingle power plant, specification 152-D.	5,577.00	¹ 5,577.00	
506-F	June 20	Price Bros.	Earthwork, lateral division 2, Fort Laramie unit, schedules 1 and 7.	3,065.00	¹ 3,084.20	May 10
	...do....	Tol Griffy	Earthwork, lateral division 2, Fort Laramie unit, schedule 6.	1,344.00	¹ 1,431.74	Apr. 30
	June 21	Western Timber & Pole Co.	Poles	2,395.50	¹ 3,626.86	
	June 25	Standard Under-	No. 6 B. S. gauge cable	907.50	¹ 907.50	
	June 28	Vulcan Iron Works	Gates, items 1 and 2, schedule 1, specification 155-D.	310.00	¹ 310.00	1918. Sept. 20
507-F	July 10	Wilson & Knight	Earthwork, lateral division 2, Fort Laramie unit, schedules 8, 9, and 10.	3,912.80	¹ 3,927.84	Dec. 31
508-F	Aug. 1	Chas. Wilson	Earthwork, lateral division 2, Fort Laramie unit, schedule 11.	1,363.50	¹ 1,306.56	Do.
	...do....	E. E. Wilson	Earthwork, lateral division 2, Fort Laramie unit, schedules 12, 13.	2,247.50	¹ 2,078.30	1919. May 17
509-F	Aug. 3	R. R. Knight	Earthwork, lateral division 2, Fort Laramie unit, schedules 14, 15.	3,012.00	¹ 2,863.37	1918. Dec. 31
	...do....	Chas. Wilson	Earthwork, lateral division 2, Fort Laramie unit, schedule 15.	1,412.00	¹ 1,610.40	Do.
	Aug. 14	Macomber & Whyte Co.	1½ hoisting rope	2,511.00	¹ 2,388.91	
512-F	Sept. 9	R. R. Knight	Earthwork, lateral division 2, Fort Laramie unit, schedule 17.	1,608.00	¹ 1,740.24	1919. June 1
	...do....	Chas. Wilson	Earthwork, lateral division 2, Fort Laramie unit, schedule 18.	1,481.37	¹ 1,517.25	Do.
	Sept. 20	R. Hardesty Manufacturing Co.	Gates, schedule 1, specification 164-D.	935.46	¹ 935.46	1918. Nov. 3
	Sept. 18	Stearns Rogers Co.	Gates, schedules 2 and 3, specification 164-D.	655.00	¹ 655.00	Dec. 5
513-F	Sept. 20	S. L. Smith	Earthwork, lateral division 2, Fort Laramie unit, schedules 19, 20, 21.	4,018.75	¹ 4,127.46	1919. June 1

¹ Completed.

Principal current contracts—Continued.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT—Continued.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
511-F	1918. Sept. 28	Lingle Construction Co.	Constructing 2 permanent cottages at Lingle power plant.	\$4,437.00	1 \$4,437.00	1919. Feb. 12
514-F	...do....	Roy Price.....	Earthwork, lateral division 1, laterals 4.7 and 5.7.	1,688.40	1 1,849.68	Apr. 30
	Oct. 2	J. W. Talmage.....	Earthwork, Spottedtail division channel, interstate unit.	336.00	1 300.48	
	Oct. 17	R. Hardesty Manufacturing Co.	Wooden forms.....	1,600.00	1 1,600.00	
	Nov. 15	R. A. Bissel.....	Earthwork, lateral 1 extension, Interstate unit.	224.00	1 219.52	
	Dec. 12	Vulcan Iron Works..	Gates, schedule 2, specification 171-D.	796.00	1 796.00	Mar. 1
	Dec. 28	R. Hardesty Manufacturing Co.	Gates, schedule 4, specification 174-D.	212.10	1 212.10	Feb. 22
	1919. Feb. 14	Lee E. Garton.....	Earthwork, lateral 10-4E Interstate unit.	82.50	1 84.90	
	Mar. 19	Metal Welding & Supply Co.	Welding sheet steel plates in steel-lined outlet conduit, Pathfinder Dam, specification 188-D.	832.00	.....	Apr. 15
600-F	Apr. 23	Chas. Wilson.....	Earthwork, schedule 1, specification 600-F, Northport unit.	663.38	1 458.27	June 1
	Apr. 17	J. C. Hinds.....	...do....	655.75	1 589.10	Do.
	Apr. 18	The Vulcan Iron Works Co.	Gates, schedules 1 and 2, specification 187-D.	888.00	1 888.00	July 4
	May 8	H. E. Knowlton....	Earthwork, schedules 3 and 4, specification 600-F, Northport unit.	1,860.50	1 1,792.24	June 1
517-F	May 10	J. R. Palmer.....	Earthwork, lateral division 1, Fort Laramie unit, lateral 17.8 and 20.1.	235.80	1 317.34	June 10

NEVADA, NEWLANDS PROJECT.

805	1918. Jan. 25	The Parsons Co.	Parsons excavator.....	\$8,200.00	None.	(*)
	Oct. 15	Monaghan Machine Co.	2 model 1-T walking drag-line excavators.	26,900.00	26,900.00	1919. Apr. 15
	Nov. 19	Minden Inn Co.	Lease of storerooms, Minden..	345.00	345.00	(*)
	Apr. 25	Southern Pacific Co.	Liquidation of damages.....	1,149.00	1,149.00	(*)
	1919. Feb. 26	Placer County Abstract & Title Co.	Furnishing abstracts of title..	500.00	None.	(*)
	Mar. 15	James A. Wood.....	Earthwork, schedule 4KX lateral.	267.00	267.00	1919. Mar. 30
	...do....	Thos. V. Conner.....	Earthwork, Heritage lateral.	262.00	262.00	Apr. 7
	...do....	S. M. Fulkerson.....	Earthwork, schedule 3-K9X lateral.	182.00	182.00	Mar. 30
	Apr. 16	James A. Wood.....	Earthwork, BX lateral.....	366.00	366.00	June 10
	June 30	J. C. Shepard.....	Earthwork, Bell and Q laterals.	2,114.00	None.	Aug. 6
	June 20	James A. Wood.....	Earthwork, schedule 1, Q laterals.	523.00	None.	July 27

NEW MEXICO, CARLSBAD PROJECT.

488	1918. Aug. 3	Atchison, Topeka & Santa Fe Ry. Co.	Lease of warehouse site.....	\$180.00	\$90.00	1920. Aug. 8
502	1919. Jan. 1	City of Carlsbad, N. Mex.	Rental of irrigation water....	200.00	60.00	1919. Dec. 31

1 Completed.
2 Undetermined.

3 At end of any calendar month.
4 Not provided.

Principal current contracts—Continued.

NEW MEXICO, CARLSBAD PROJECT—Continued.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
479	1918. May 28	Nathan V. Cook....	Rental of 551.32 acres grazing lands, McMillan Reservoir.	886.75	354.70	1920. Dec. 31
471	May 4	John H. Fanning...	Rental of 928.47 acres grazing lands, McMillan Reservoir.	1,121.26	464.23	Do.
474	May 18	Bob Gushwa.....	Rental of 418.01 acres grazing lands, McMillan Reservoir.	241.40	91.96	Do.
476	May 20	A. A. Kaiser.....	Rental of 136.03 acres grazing lands, McMillan Reservoir.	88.78	34.01	Do.
487	Aug. 1	Wm. T. Reed.....	Lease of room for printing office.	240.00	220.00	1919. July 31
473	May 15	G. H. Sellmeyer.....	Rental of 219.91 acres grazing lands, McMillan Reservoir.	606.15	230.91	1920. Dec. 31

NEW MEXICO-TEXAS, RIO GRANDE PROJECT.

748	1916. Dec. 29	Bucyrus Co.....	Drag-line excavators	\$62,045.00	\$62,045.00	
762	1917. Apr. 17	.....do.....	.....do.....	77,615.00	77,615.00	
1 762	1918. Feb. 7	.....do.....	.....do.....	27,472.00	27,472.00	
1 743	Feb. 17	.....do.....	.....do.....	29,760.00	29,760.00	
796	Apr. 13	Lee Moor Contracting Co.	Earthwork, Garfield Canal schedules 1-8.	32,171.28	32,171.28	1918. July 31
800	May 24	Jennings Construction & Engineering Co.	Earthwork, Leasburg drain.	52,500.00	17,426.51	1920. Apr. 3
	June 29	Lee Moor Contracting Co.	Earthwork, Salatrul Canal...	4,203.90	4,203.90	1919. Sept. 28
	Aug. 13	Mrs. J. N. Bradt....	Earthwork, South Side lateral.	4,142.88	4,142.88	Nov. 10
802	Sept. 3	Lee Moor Contracting Co.	Earthwork, San Elizario feeder canal.	8,514.00	8,514.00	Sept. 19
804	Sept. 18	.....do.....	Earthwork, Yala lateral.....	7,579.83	7,579.83	Nov. 1
	Sept. 20	Stearns Roger Manufacturing Co.	Radial gates and hoists.....	3,090.00	3,090.00	Dec. 20
805	.....	(Monighan Machine Co.)	Drag-line excavators	40,901.00	40,901.00	1919. Mar. 25
806	Oct. 1	Harlan & Wright...	Earthwork, Hatch Canal, schedules 12, 13.	10,938.50	6,477.79	Feb. 19 Jan. 16
	Oct. 7	Barney R. Russell and J. R. McCutcheon.	Earthwork, Rincon Canal, schedule 8.	4,676.00	4,129.97	Nov. 4
	Oct. 8	Ramon Jaramillo...	Earthwork, Rincon Canal, schedule 1.	3,124.04	3,465.00	Feb. 7
	...do....	Monico Jiminez.....	Earthwork, Rincon Canal, schedule 2.	3,126.12	3,389.05	Feb. 25
	...do....	J. J. Trujillo.....	Earthwork, Rincon Canal, schedule 4.	4,258.00	3,375.00	Feb. 18
	Oct. 16	B. B. Romig.....	Earthwork, Hatch Canal, road.	700.20	609.36	Feb. 25
	Oct. 28	G. J. Romig.....	Earthwork, Hatch Canal, schedule 10.	3,241.90	4,484.48	Feb. 5
	...do....	S. C. Garcia.....	Earthwork, Hatch Canal, schedule 11.	3,290.90	2,460.14	Feb. 6
	Nov. 29	B. B. Romig.....	Earthwork, Hatch Canal, schedule 9.	1,038.00	2,128.00	Feb. 5
	Nov. 18	J. H. Jones.....	Earthwork, Rincon Canal, schedule 5.	4,512.30	4,968.36	Mar. 20
	Dec. 10	F. H. Harris and J. C. Rous, Jr.	Earthwork, lateral I. F. 57...	3,806.30	4,431.28	Feb. 28
	Dec. 11	R. S. Roberts.....	Earthwork, Mesilla Canal, schedule 2.	3,242.00	2,698.65	Mar. 10

1 Amended.

Principal current contracts—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due
	1918.					1919.
	Dec. 11	A. H. Loomis.....	Earthwork, Mesilla Canal, schedule 3.	3,602.00	2,148.00	Mar. 13
	...do....	Francisco T. Lopez..	Earthwork, Mesilla Canal, schedule 4.	3,002.00	1,828.75	Do.
	...do....	Victor T. Lopez.....	Earthwork, Mesilla Canal, schedule 5.	3,242.00	2,035.80	Do.
	...do....	Florencio Lopez.....	Earthwork, Mesilla Canal, schedule 6.	3,522.00	1,066.40	Mar. 10
	...do....	Wm. H. Mundy.....	Earthwork, Mesilla Canal, schedule 1.	3,252.00	2,806.75	Do.
	...do....	Nicholas A. Gehl....	Earthwork, Las Cruces Canal, schedule 2.	3,152.00	3,337.25	Jan. 8
	Dec. 12	Felix Carrillo.....	Earthwork, Las Cruces Canal, schedule 1.	3,502.00	3,451.00	Mar. 29
	...do....	Dan W. Williams....	Earthwork, Las Cruces Canal, schedule 5.	3,202.00	2,553.60	Mar. 17
	...do....	P. V. Barncastle....	Earthwork, Dona Ana Canal, schedule 1.	2,402.00	885.00	Mar. 8
	...do....	J. M. Barncastle....	Earthwork, Dona Ana Canal, schedule 2.	2,402.00	2,311.00	Mar. 13
	...do....	H. Wertheim.....	Earthwork, Dona Ana Canal, schedule 3.	2,402.00	1,881.00	Mar. 9
	...do....	G. A. Schafer.....	Earthwork, La Mesa Canal, schedule 1.	1,052.00	1,426.95	Mar. 13
	...do....	J. F. Lewis.....	Earthwork, Chamberino Canal, schedule 1.	4,502.00	3,463.80	Mar. 22
	...do....	A. W. Crowder.....	Earthwork, Chamberino Canal, schedule 2.	4,502.00	3,606.30	Feb. 8
	...do....	.....do.....	Earthwork, Chamberino Canal, schedule 3.	4,502.00	5,138.10	Mar. 22
	...do....	F. E. Monaghan....	Earthwork, Las Cruces Canal, schedule 6.	3,202.00	2,009.60	Mar. 17
	Dec. 13	F. G. Belk.....	Earthwork, La Mesa Canal, schedule 2.	872.00	2,272.73	Mar. 11
	...do....	H. Aubert.....	Earthwork, La Mesa Canal, schedule 3.	872.00	2,303.76	Do.
	Dec. 16	R. Hardesty Manufacturing Co.	Flume material.....	2,284.80	2,284.80	Feb. 2
	Dec. 17	A. Baca.....	Earthwork, Las Cruces Canal, schedule 4.	2,522.00	1,488.20	Mar. 15
	Dec. 26	Julio Jabala.....	Earthwork, Mesilla Dam dike.	2,962.00	3,312.05	Mar. 16
	1919					
	Jan. 4	Lee Moor Contracting Co.	Earthwork, Island main lateral, and I-3 lateral.	9,406.50	13,346.50	Mar. 31
	Jan. 6	Harris & Rous.....	Earthwork, Cuadrilla lateral, schedule 1.	1,282.00	1,212.91	Feb. 5
	...do....	.....do.....	Earthwork, Cuadrilla lateral, schedule 2.	.....	3,424.68	Feb. 25
	June 13	Catarino Morales....	Earthwork, Three Saints Canal, schedule 4.	3,902.00	4,013.70	Feb. 19
	Jan. 29	V. Garcia.....	Earthwork, Mesilla lateral, schedule 7.	1,227.00	2,101.75	Feb. 12
	...do....	J. C. Robbins.....	Earthwork, Mesilla lateral, schedule 9.	437.00	1,989.40	Mar. 6
	Jan. 30	D. W. Williams....	Earthwork, Las Cruces Canal, schedule 11.	242.00	1,200.00	Mar. 5
	Feb. 4	Luis Alvarez.....	Earthwork, Las Cruces lateral, schedule 7.	902.00	3,262.50	Mar. 30
	...do....	Nicholas A. Gehl....	Earthwork, Las Cruces lateral, schedules 9 and 10.	2,078.80	1,689.60	Do.
	Feb. 6	R. L. Faulkner.....	Earthwork, Dona Ana lateral, schedule 4.	877.00	2,628.00	Apr. 3
808	Feb. 16	Lee Moor Contracting Co.	Island feeder canal.....	5,128.40	5,464.50	Mar. 28
	Feb. 17	P. B. Barncastle....	Earthwork, Las Cruces Canal, schedule 12.	1,682.00	1,904.19	Apr. 2
	Feb. 19	Harlan & Wright...	Earthwork, Rincon lateral system, schedules 3 and 4	3,556.75	3,330.09	May 24
	Mar. 1	.....do.....	Earthwork, Rincon lateral systems, schedules 1 and 2.	3,724.00	2,940.37	Apr. 8
809	Mar. 10	Rosedale Foundry & Machine Co.	Balanced valve parts, Elephant Butte Dam.	10,850.00	.....	June 25
	Mar. 14	F. E. Monaghan....	Earthwork, Las Cruces lateral, schedule 8.	258.00	2,188.80	Apr. 24

Principal current contracts—Continued.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT—Continued.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
812	1919 Mar. 21	Stearns Roger Manufacturing Co.	Balanced valve parts, Elephant Butte Dam.	\$6,250.00	.....	1919 June 1
	Mar. 25	Lee Moor Contracting Co.	Earthwork, north side lateral schedule 1.	3,787.00	\$4,144.92	Apr. 14
	Apr. 28	R. Hardesty Manufacturing Co.	Metal flume.....	3,367.69	3,367.69	.....

OREGON, UMATILLA PROJECT.

	1919 Mar. 10	Boynton & Longhorn.	Construction gatetender's quarters at Three Mile Falls dam.	\$2,200.00	\$2,200.00	1919 June 7
--	-----------------	---------------------	---	------------	------------	----------------

SOUTH DAKOTA, BELLE FOURCHE PROJECT.

	1918 Oct. 30	Wilson & McEwen.	Construction of two cottages at Newell, S. Dak.	\$4,225.00	.....	1919 May 31
	1919 Mar. 29	Charles, W.....	Construction of Deer Creek drain.	2,000.00	.....	Dec. 12

WASHINGTON, OKANOGAN PROJECT.

	1919 July 23	A. H. Cox & Co. (Inc.).	Purchase 150 H.P. Weber internal combustion engine.	\$4,500.00	\$4,500.00	1919 Aug. 30
--	-----------------	-------------------------	---	------------	------------	-----------------

WASHINGTON, YAKIMA PROJECT, STORAGE UNIT.

	1918 Mar. 7	National Tank & Pipe Co.	Wood-stave pipe.....	\$2,620.00	\$2,309.06	1918 May 23
--	----------------	--------------------------	----------------------	------------	------------	----------------

WASHINGTON, YAKIMA PROJECT, SUNNYSIDE UNIT.

625 Supplement to 591 ¹	1915 Mar. 25	Chas. C. Moore.....	Hydraulic machinery.....	\$10,611.00	\$10,611.00	1917 Jan. 16
	1916 Feb. 29	Pelton Water Wheel Co.	.....do.....	7,063.30	7,063.30	1919 May 1
	1918 Mar. 16	Pacific Coast Pipe Co.	Wood-stave pipe.....	29,925.54	29,925.54	1918 May 23
796	Mar. 11	Fairbanks, Morse Co.	Hydraulic machinery.....	16,200.00	16,200.00	Sept. 30
795	Apr. 30	Pacific Tank & Pipe Co.	Wood-stave pipe.....	4,655.00	4,655.00	June 11

WASHINGTON, YAKIMA PROJECT, TIETON UNIT.

	1918 Nov. 22	F. C. Howard.....	Patrol house.....	\$2,426.99	\$2,426.99	1919 Jan. 6
--	-----------------	-------------------	-------------------	------------	------------	----------------

PRINCIPAL CURRENT CONTRACTS.

509

Principal current contracts—Continued.

WYOMING, SHOSHONE PROJECT.

No.	Date.	Contractor.	Description.	Estimated value.	Estimated earnings June 30, 1919.	Completion due.
757	1916 Sept. 11	Hoyt Hayden.....	Frannie Canal extension and lateral.	\$121,484.63	\$121,484.63	1918 Nov. 4
756	Oct. 18 1917	Peter Shirts ¹.....	.....do.....	12,865.81	5,023.86	1917 May 31
758	Apr. 26	H. S. Jolley.....	.....do.....	4,418.31	4,418.31	1918 Dec. 6
755	Apr. 16	N. O. Mortenson.....	.....do.....	9,440.00	4,853.60	1919 June 15
754	Apr. 16	Tebbs & Taggart.....	.....do.....	19,700.00	18,230.45	June 20
778	July 30	David Lewis.....	.....do.....	10,610.00	9,307.81	July 7
	1918 Dec. 26	H. Downer.....	Earthwork.....	2,100.00	1,597.43	June 21
	Nov. 30 1917	Wm. Peterson.....	.....do.....	860.00	688.56	June 30
	Nov. 26 1919	Lynn Bros.....	Back filling.....	3,594.34	3,594.34	1918 Oct. 8
	May 17	G. B. Wilson.....	Earthwork.....	1,684.00	744.00	1919 July 11

WYOMING, RIVERTON (INDIAN) PROJECT.

	1919 May 16	Newton Ferguson...	Construction of two 5-room cottages.	\$2,571.00	1919 Sept. 1
--	----------------	--------------------	--------------------------------------	------------	-------	-----------------

¹Suspended.

Red Devil (Trident, Mont.).....	Neat..... (3 to 1).....	95 100	728 487	95 100	711 479	95 90	689 470	95 90	665 459	90 80	641 447	45 45	639 464	15 15	624 434	..... 40	..... 40	..... 681
Red Diamond (Utah) :.....	Neat..... (3 to 1).....	95 100	722 470	95 90	759 486	95 90	759 482	90 45	761 448	90 25	738 420	80 15	711 414	60 5	715 401	40 40	..... 402	..... 402
Riverdale.....	Neat..... (3 to 1).....	45 25	757 460	45 25	752 473	45 25	752 447	45 25	740 380	25 25	749 407	15 5	735 430	5 5	734 427	..........	..........	..........
Spokane.....	Neat..... (3 to 1).....	95 30	766 449	95 30	745 439	95 40	753 424	95 25	732 372	25 25	705 356	5 5	601 367	..........	..........	..........	..........	..........
Standard (Napa Junction, Calif.).....	Neat..... (3 to 1).....	50 55	732 478	40 45	736 480	40 45	770 506	40 15	710 467	40 15	742 491	20 15	683 470	10 10	636 436	..........	..........	..........
Sundowner (Independence, Kans.).....	Neat..... (3 to 1).....	15 15	925 496	15 15	881 504	15 15	824 470	15 15	803 467	15 15	739 445	15 15	782 450	10 10	819 421	10 10	..... .....	760 423
Sundowner (Iola, Kans.).....	Neat..... (3 to 1).....	55 55	820 434	55 55	807 424	55 55	765 387	55 70	755 367	55 70	744 373	55 70	714 371	55 70	753 378	50 50	..... .....	698 361
Universal (South Chicago, Ill.).....	Neat..... (3 to 1).....	70 70	860 420	70 70	817 407	70 70	799 402	70 60	781 372	70 60	751 346	70 60	745 351	70 60	738 356	65 65	..... .....	736 340
Yankton.....	Neat..... (3 to 1).....	60 60	791 433	60 60	785 440	60 60	773 430	60 60	748 414	60 60	768 420	60 60	732 412	60 60	759 409	45 45	..... .....	686 404
Total.....	(Neat..... Sand.....)	2,005 2,046	762 430	1,670 1,770	790 442	1,885 1,920	762 443	1,520 1,520	744 427	1,405 1,405	735 411	1,100 1,100	711 415	780 770	711 410	440 440	..... .....	705 391

* Made at same plant. Brand name changed from Inland to Lehigh, April, 1914.
: Made at same plant. Brand name changed from Red Diamond to Utah, June, 1910.

UNIT BIDS AND CONTRACT PRICES.

Unit bids and contract prices on formal specifications.

BACK FILLING, PUDDLED.

State and project.	Date opening bids.	Specification No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
Wyoming, Shoshone.....	Nov. 16, 1918	4-1918	Structural excavation, second unit, Franlie division.	Cubic yard.....	300	\$0.75	.....	\$0.75

BUILDINGS.

Montana, Sun River.....	Mar. 20, 1919	186-D	Erecting, finishing, and painting 5-room cottage.	Each.....	1	\$894.00	\$1,229.00	\$894.00
Do.....	do.....	186-D	Erecting, finishing, and painting Fairfield office.	do.....	1	419.00	849.00	419.00
Do.....	do.....	188-D	Erecting, finishing, and painting Fairfield lodging house.	do.....	1	411.00	801.00	411.00
Do.....	do.....	186-D	Erecting, finishing, and painting 3-car garage.	do.....	1	228.00	279.00	228.00
Do.....	do.....	186-D	Erecting, finishing, and painting Fairfield stable.	do.....	1	210.00	400.00	210.00
Wyoming, Riverton.....	May 14, 1919	190-D	5-room frame cottages.....	do.....	2	1,285.50	1,650.00	1,285.50

EARTHWORK.

Montana, Milk River.....	June 19, 1918	M.R.P.4	Backfill, Cow Creek wasteway.....	Cubic yard.....	600	\$0.30	\$0.30	\$0.30
Do.....	July 6, 1918	M.R.P.6	Excavation, lateral NS-116 extension.....	do.....	2,000	.23	.30	.23
Do.....	Sept. 16, 1918	M.R.P.7	Repairs to upper Peoples Creek dike.....	do.....	3,000	.24	.31	.24
Nevada, Newlands.....	Oct. 26, 1918	M.R.P.9	Milk River Cut-off, Point of Rocks.....	do.....	1,200	.294	.....	.294
Do.....	Mar. 15, 1919	1	Heritage lateral, schedules 1 and 2.....	do.....	1,750	.15	.....	.....
Do.....	do.....	1	K9X lateral, schedule 3.....	do.....	1,519	.12	.....	.....
Do.....	do.....	1	K9X lateral, schedule 4.....	do.....	1,485	.18	.....	.....
Do.....	Apr. 15, 1919	2	BX lateral extension, schedule 1.....	do.....	1,925	.19	.....	.....
Do.....	June 20, 1919	3	Q lateral, schedule 1.....	do.....	2,908	.18	.....	.....
Do.....	June 30, 1919	3	Q lateral, schedule 2.....	do.....	3,184	.20	.....	.....
Do.....	do.....	3	Q lateral, schedule 3.....	do.....	2,410	.20	.....	.....
Do.....	do.....	3	Bell lateral, schedule 6.....	do.....	2,360	.20	.....	.....
Do.....	do.....	3	Bell lateral, schedule 7.....	do.....	2,582	.20	.....	.....

Unit bids and contract prices on formal specifications—Continued.

EVACUATION CLASS 1—Continued.

State and project.	Date opening bids.	Specifica- tion No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
Idaho, Boise.....	Jan. 15, 1919		Notus Canal, schedule 37.....	Cubic yards.....	1,800	\$0.24	\$0.25	\$0.25
Do.....	do.....		Notus Canal, schedule 38.....	do.....	1,600	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 39.....	do.....	1,600	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 40.....	do.....	1,800	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 41.....	do.....	1,800	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 42.....	do.....	1,800	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 43.....	do.....	1,900	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 44.....	do.....	1,900	.24	.25	.25
Do.....	do.....		Notus Canal, schedule 45.....	do.....	2,000	.19	.24	.19
Do.....	do.....		Notus Canal, schedule 46.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 47.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 48.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 49.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 50.....	do.....	2,800	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 51.....	do.....	2,800	.24	.25	.26
Do.....	do.....		Notus Canal, schedule 52.....	do.....	2,700	.24	.25	.26
Do.....	do.....		Notus Canal, schedule 53.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 54.....	do.....	2,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 55.....	do.....	15,600	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 56.....	do.....	15,600	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 57.....	do.....	17,000	.25	.26	.26
Do.....	do.....		Notus Canal, schedule 58.....	do.....	3,500	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 59.....	do.....	1,400	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 60.....	do.....	1,600	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 61.....	do.....	500	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 62.....	do.....	700	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 63.....	do.....	3,000	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 64.....	do.....	2,000	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 65.....	do.....	3,000	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 66.....	do.....	3,700	.25	.34	.40
Do.....	do.....		Notus Canal, schedule 68.....	do.....	29,000	.25	.34	.49
Idaho, King Hill.....	Aug. 26, 1918	(¹)	Main canal, stations 93 to 106+51.....	do.....	49,000	.1966	(¹)	Rejected.
Nebraska-Wyoming.....	Oct. 15, 1918	333	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 1.....	do.....	25,000	.17	.175	Rejected.
North Platte.....	do.....	333	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 2.....	do.....	45,000	.19	.1966	Rejected.
Do.....	do.....	333	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 3.....	do.....	23,000	.19	.1966	Rejected.
Do.....	do.....	333	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 4.....	do.....	23,000	.19	.1966	Rejected.

[illegible]

1 Specifications issued from project office.
2 Rejected bids forwarded to returns office with Reynolds-Ply Construction Co. contract. This information not retained in project office.
3 Only one received.
4 Specifications issued in project office.
5 Informal proposals received after date of opening.

Unit bids and contract prices on formal specifications—Continued.

EXCAVATION, CLASS 1—Continued.

State and project.	Date opening bids.	Specification No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
New Mexico—Texas, Rio Grande—Con.	Nov. 30, 1918	(1)	Dona Ana Canal, schedule 2	Cubic yards.	8,000	\$0.300		\$0.300
Do.	do.	(1)	Dona Ana Canal, schedule 3	do.	8,000	.300		.300
Do.	do.	(1)	Chamberino Canal, schedule 1	do.	15,000	.300		.300
Do.	do.	(1)	Chamberino Canal, schedule 2	do.	15,000	.300		.300
Do.	do.	(1)	Chamberino Canal, schedule 3	do.	15,000	.300		.300
Do.	do.	(1)	Island main lateral 1-3, lateral.	do.	47,000	.200		.200
Do.	do.	(1)	Mesilla Dam dike.	do.	8,400	.350		.350
Do.	Dec. 3, 1918	(1)	Chadrilla lateral, schedule 1	do.	11,000	.235	\$0.240	Rejected
Do.	Dec. 7, 1918	(1)	Chadrilla lateral, schedule 2	do.	14,000	.240	.255	
Do.	Dec. 31, 1918	(1)	Chadrilla lateral, schedule 1	do.	5,000	.255	.270	
Do.	do.	(1)	Three Saints Canal, reassess schedule 4	do.	13,000	.300	.300	
Do.	do.	(1)	Dona Ana lateral, schedule 4	do.	350	.350		.350
Do.	Jan. 2, 1919	(1)	Las Cruces laterals, schedule 7	do.	2,500	.300		.300
Do.	do.	(1)	Las Cruces laterals, schedule 8	do.	3,000	.300		.300
Do.	do.	(1)	Las Cruces laterals, schedule 9	do.	8,000	.320		.320
Do.	do.	(1)	Las Cruces laterals, schedule 10	do.	4,235	.240	.240	
Do.	do.	(1)	Las Cruces laterals, schedule 11	do.	4,410	.240	.260	
Do.	do.	(1)	Las Cruces laterals, schedule 12	do.	750	.320	.380	Rejected
Do.	Jan. 3, 1919	(1)	Juan d'Herrera lateral, Branch B.	do.	5,000	.460		.460
Do.	Jan. 4, 1919	(1)	Mesilla laterals, schedule 1	do.	3,500	.350		.350
Do.	do.	(1)	Mesilla laterals, schedule 8	do.	1,800	.350		.350
Do.	do.	(1)	Mesilla laterals, schedule 9	do.	1,500	.300	.310	Rejected
Do.	do.	(1)	Island feeder canal, raising banks.	do.	16,000	.320		.320
Do.	Jan. 11, 1919	(1)	Rincon lateral system, schedules 1-2.	do.	224	.224	.255	
Do.	Jan. 16, 1919	(1)	Rincon lateral system, schedule 3.	do.	11,700	.2775		.2775
Do.	do.	(1)	Rincon lateral system, schedule 4.	do.	16,500	.300		.300
Do.	Jan. 17, 1919	(1)	Las Cruces Canal, schedule 12	do.	6,000	.280		.280
Do.	Jan. 18, 1919	(1)	North Side lateral, schedule 1	do.	14,000	.260	.270	
Do.	Jan. 21, 1919	(1)	L. O. lateral, schedule 1	do.	13,000	.240		.240
Do.	Mar. 19, 1919	(1)	Deer Creek drain.	do.	5,400	.22		.22
South Dakota, Belle Fourche.								
Wyoming, Shoshone	July 3, 1918	3-1918	Bitter Creek, lateral line 5.	do.	4,500	.20		.20
Do.	Nov. 16, 1918	4-1918	Structural Exc. Second unit, Framie division.	do.	7,300	.25	.25	
Do.	May 14, 1919	1-1919	Deaver Canal extensions.	do.	9,000	.18	.19	.18

EXCAVATION, CLASS 2.

[illegible]

! Specifications issued in project office.

2 Informal proposals received after date of opening

Unit bids and contract prices on formal specifications—Continued.

EXCAVATING, CLASS 2—Continued.

State and project.	Date opening bids.	Specification No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
Idaho-Bolde	Jan. 18, 1919		Notus Canal, schedule 37.	Cubic yards.	200	75	78	.85
Do.	do.		Notus Canal, schedule 38.	do.	200	75	78	.90
Do.	do.		Notus Canal, schedule 39.	do.	200	75	78	.90
Do.	do.		Notus Canal, schedule 40.	do.	200	75	78	.90
Do.	do.		Notus Canal, schedule 41.	do.	200	75	78	.90
Do.	do.		Notus Canal, schedule 42.	do.	100	75	78	.90
Do.	do.		Notus Canal, schedule 43.	do.	100	75	78	.90
Do.	do.		Notus Canal, schedule 44.	do.	100	75	78	.90
Do.	do.		Notus Canal, schedule 45.	do.	100	50	75	.50
Do.	do.		Notus Canal, schedule 46.	do.	100	50	75	.50
Do.	do.		Notus Canal, schedule 47.	do.	100	75	78	.75
Do.	do.		Notus Canal, schedule 48.	do.	100	75	78	.75
Do.	do.		Notus Canal, schedule 49.	do.	100	75	78	.75
Do.	do.		Notus Canal, schedule 50.	do.	100	75	78	.75
Do.	do.		Notus Canal, schedule 51.	do.	200	60	75	.75
Do.	do.		Notus Canal, schedule 52.	do.	200	60	75	.75
Do.	do.		Notus Canal, schedule 53.	do.	200	65	75	.75
Do.	do.		Notus Canal, schedule 54.	do.	200	65	75	.75
Do.	do.		Notus Canal, schedule 55.	do.	400	60	75	.75
Do.	do.		Notus Canal, schedule 56.	do.	400	60	75	.75
Do.	do.		Notus Canal, schedule 57.	do.	400	60	75	.75
Do.	do.		Notus Canal, schedule 58.	do.	400	60	75	.75
Do.	do.		Notus Canal, schedule 59.	do.	100	75	80	.90
Do.	do.		Notus Canal, schedule 60.	do.	200	75	80	.90
Do.	do.		Notus Canal, schedule 61.	do.	200	75	80	.90
Do.	do.		Notus Canal, schedule 62.	do.	200	75	80	.90
Do.	do.		Notus Canal, schedule 63.	do.	300	75	80	.90
Do.	do.		Notus Canal, schedule 64.	do.	300	75	80	.90
Do.	do.		Notus Canal, schedule 65.	do.	300	75	80	.90
Do.	do.		Notus Canal, schedule 66.	do.	300	75	80	.90
Do.	do.		Notus Canal, schedule 67.	do.	300	75	80	.90
Do.	do.		Notus Canal, schedule 68.	do.	12,500	49	50	.49
Do.	do.		Main Canal, stations 93 to 105+51.	do.	200	21	50	Rejected.
Idaho, King Hill.	Aug. 26, 1918	(1)	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 1.	do.	100	175	21	Rejected.
Nebraska-Wyoming, North Platte.	Oct. 15, 1918	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 1.	do.	100	175	21	Rejected.
Do.	do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 2.	do.	200	21	50	Rejected.
Do.	do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 3.	do.	200	21	50	Rejected.
Do.	do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 4.	do.	100	21	50	Rejected.

Do.	do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 6.	do.	100	.21	.50	Rejected.
Do.	Nov. 2, 1918	384	Northport Canal, schedule 1.	do.	500	.60	1.00	Rejected.
Do.	do.	384	Northport Canal, schedule 2.	do.	65,000	.55	(5)	Rejected.
Do.	do.	384	Northport Canal, schedule 3.	do.	20,400	.55	(5)	Rejected.
Do.	do.	384	Northport Canal, schedule 4.	do.	500	.60	.40	Rejected.
South Dakota, Belle Fourche.	Mar. 19, 1919		Deer Creek drain.	do.	100	.22		
Wyoming, Shoshone.	May 14, 1919	1-1919	Deer Canal extensions.	do.	100	.19		

EXCAVATION, CLASS 3.

Colorado, Uncompagre Valley.	Oct. 1, 1918	McClanahan lateral, schedule 1, item 3.	Cubic yards.	20	\$0.05	\$0.29	\$0.05
Idaho, Boise.	do.	McClanahan lateral, schedule 2, item 3.	do.	20	.05	.31	.05
Do.	Jan. 18, 1919.	Notus Canal, feeder 1, schedule 1.	do.		1.98	2.00	2.80
Do.	do.	Notus Canal, feeder 2, schedule 1.	do.		1.98	2.00	2.80
Do.	do.	Notus Canal, feeder 2, schedule 2.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 3.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 4.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 5.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 6.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 7.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 8.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, feeder 2, schedule 9.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 1.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 2.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 3.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 4.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 5.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 6.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 7.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 8.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 9.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 10.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 11.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 12.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 13.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 14.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 15.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 16.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 17.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 18.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 19.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 20.	do.		1.98	2.00	2.00
Do.	do.	Notus Canal, schedule 21.	do.		1.75	1.98	2.00
Do.	do.	Notus Canal, schedule 22.	do.		.175	1.75	.175

1 Specifications issued from project office.

2 Rejected bids forwarded to returns office with Reynolds-Ely Construction Co. contract. This information not retained in project office.

3 Only 1 received.

Unit bids and contract prices on formal specifications—Continued.

EXCAVATION, CLASS 3—Continued.

State and project.	Date opening bids.	Specification No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
Idaho-Bolse	Jan. 18, 1919		Notus Canal, schedule 23	Cubic yards.		\$0.17 3/4	\$1.75	\$0.17 3/4
Do.....	do.		Notus Canal, schedule 24	do.		.17 1/4	1.75	.17 1/4
Do.....	do.		Notus Canal, schedule 25	do.		1.75	1.98	2.00
Do.....	do.		Notus Canal, schedule 26	do.		.17	1.98	.17
Do.....	do.		Notus Canal, schedule 27	do.		.17	1.75	.17
Do.....	do.		Notus Canal, schedule 28	do.		.15	1.75	.15
Do.....	do.		Notus Canal, schedule 29	do.		.80	1.75	.80
Do.....	do.		Notus Canal, schedule 30	do.		.80	1.75	.80
Do.....	do.		Notus Canal, schedule 31	do.		.80	1.75	.80
Do.....	do.		Notus Canal, schedule 32	do.		1.75	2.00	2.00
Do.....	do.		Notus Canal, schedule 33	do.	300	1.75	2.00	1.75
Do.....	do.		Notus Canal, schedule 34	do.	100	1.75	2.00	1.75
Do.....	do.		Notus Canal, schedule 35	do.	200	1.75	2.00	1.75
Do.....	do.		Notus Canal, schedule 36	do.	100	2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 37	do.		2.00	2.00	3.00
Do.....	do.		Notus Canal, schedule 38	do.		2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 39	do.		2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 40	do.	100	2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 41	do.		2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 42	do.		2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 43	do.		2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 44	do.		2.00	2.00	3.00
Do.....	do.		Notus Canal, schedule 45	do.		2.00	2.00	3.00
Do.....	do.		Notus Canal, schedule 46	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 47	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 48	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 49	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 50	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 51	do.		1.40	2.00	2.50
Do.....	do.		Notus Canal, schedule 52	do.		1.50	2.00	2.50
Do.....	do.		Notus Canal, schedule 53	do.		1.50	2.00	2.50
Do.....	do.		Notus Canal, schedule 54	do.		1.40	2.00	2.50
Do.....	do.		Notus Canal, schedule 55	do.		1.20	2.00	2.50
Do.....	do.		Notus Canal, schedule 56	do.		1.45	2.00	2.50
Do.....	do.		Notus Canal, schedule 57	do.		2.00	2.00	2.50
Do.....	do.		Notus Canal, schedule 58	do.	500	2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 59	do.	200	2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 60	do.	2,000	2.00	2.00	2.00
Do.....	do.		Notus Canal, schedule 61	do.		2.00	2.00	2.00

[illegible]

3 Only 1 received.

FINISHING CANAL BANKS.

WYOMING, SHOOSHONE.....	July 3, 1918	3-1918	Bitter Creek lateral b.....	Station, 100 feet.	5,700	500	5.00

FLUORESCENT MATERIAL.

New Mexico-Texas, Rio Grande.....	172-D	Flume material 108.....	Linear foot.....	840	2.72	2.72
Do.....	180-D	Flume material 120.....	do.....	600	2.84	2.84
Do.....	180-D	Flume material 132.....	do.....	300	3.15	3.15
Do.....	180-D	Flume material 144.....	do.....	300	3.84	3.84

Specifications issued from protect office.

Specifications issued from project office.
Rejected bids forwarded to returns office with Reynolds-Ely Construction Co. contract. This information not retained in project office.

Unit bids and contract prices on formal specifications—(Continued).

GATES, RADIAL, BALANCED VALVE, PARTS, METAL FURNISHINGS.

State and project.	Date opening bids.	Specification No.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
						Lowest.	Next.	
New Mexico-Texas, Rio Grande.....	Sept. 13, 1918	162-D	50 radial gates complete, with all accessories, height from 2 feet 6 inches to 4 feet 6 inches, width from 7 feet 9 inches to 15 feet 9 inches.	Job.....	.....	\$1,455.00	.....	\$1,455.00
Do.....	.....do.	162-D	50 radial gate hoists for above schedule 2.....	.....do.	.....	1,725.00	.....	1,725.00
Do.....	Feb. 10, 1919	178-D	4 sets throat pieces and 4 bronze seat rings complete, for Elephant Butte Dam, item 1.	.....do.	.....	10,560.00	\$15,250.00	10,560.00
Do.....	.....do.	178-D	4 sets complete balanced valve auxiliary control parts for Elephant Butte Dam, item 2.	.....do.	.....	6,260.00	7,990.00	6,260.00

METAL WORK.

Washington, Okanogan.....	Mar. 31, 1919	179-D	Salmon Lake Dam.....	\$365.00	(1)	\$365.00
---------------------------	---------------	-------	----------------------	-------	-------	----------	-----	----------

OVERHAUL.

Nebraska-Wyoming, North Platte.....	Oct. 15, 1918	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 1.	Station yard.....	7,000	(1)	(1)	Rejected.
Do.....	.....do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 2.	.....do.	3,000	(1)	(1)	Rejected.
Do.....	.....do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 3.	.....do.	14,000	(1)	(1)	Rejected.
Do.....	.....do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 4.	.....do.	8,000	(1)	(1)	Rejected.
Do.....	.....do.	383	East Springer lateral, Fort Laramie unit, lateral division 2, schedule 5.	.....do.	6,500	(1)	(1)	Rejected.
Do.....	Nov. 2, 1918	384	Northport Canal, schedule 1.....	.....do.	3,000	(1)	(1)	Rejected.
Do.....	.....do.	384	Northport Canal, schedule 3.....	.....do.	3,000	(1)	(1)	Rejected.
Do.....	.....do.	384	Northport Canal, schedule 4.....	.....do.	4,000	(1)	(1)	Rejected.
New Mexico-Texas, Rio Grande.....	Aug. 1, 1918	(1)	Earthwork, Ysita lateral, schedule 1.....	.....do.	25,000	0.02	0.02	0.02
Do.....	Oct. 1, 1918	(1)	Earthwork, Hatch Canal, schedule 3.....	.....do.	1,500	0.02	0.02	0.02
Wyoming, Shoshone.....	May 14, 1919	1-1919	Denver Canal extensions.....	Cubic yards.....	700	0.02	0.02	0.02

TELEPHONE LINES.

Montana, Milk River.....	June 10, 1918	{ 152-D: ready: } { 147-D }	{ Telephone line, Nelson Reservoir to Beaver- ton and Paisley to Willow Creek. }	Miles.....	33	\$2,753.50	\$4,401.00	\$2,753.60
--------------------------	---------------	--------------------------------	---	------------	----	------------	------------	------------

TEST BORINGS.

Montana, Milk River.....	Jan. 24, 1919	Spl. 2374	Dam sites for Chain Lakes Reservoir.....	Linear foot....	574	\$2.00	\$2.00
Do.....	Feb. 21, 1919	Spl. 2383	.....do.....	.....do.....	{ 229 365 }	2.00 2.50	2.00 2.50

! Information not available in project office.
; Price fixed in schedule.

! Specifications issued in project office.
; Holes less than 50 feet deep.

! Holes more than 50 feet deep.

ENGINEERING DATA FOR PROJECTS ON COMPLETION.

[The following tables of data for projects on completion, covering reservoirs, storage dams, diversion dams, canals, tunnels, and irrigable area, are necessarily subject to some revision as the projects develop and more detailed plans are prepared. In so far as they refer to works yet to be built or areas not yet covered by canal, they are not to be taken as guaranteeing that such work will ever be done. All future work depends on appropriations therefor by Congress.]

Engineering data for projects when completed.

RESERVOIRS.

Projects.	Name.	Area.	Capacity.	Spillways.			
				Length.	Elevation above stream bed.	Capacity.	
						Normal.	Maximum.
		<i>Acres.</i>	<i>Acro.-feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Sec.-ft.</i>
Arizona: Salt River.....	Roosevelt.....	16,832	1,365,000	420	225		
California: Orland.....	East Park.....	1,860	51,000	415	88	8,000	12,000
Colorado: Uncompahgre Valley.....	Taylor Park.....	2,280	106,000	(1)	(1)	(1)	(1)
Idaho:							
Boise.....	Deer Flat.....	9,835	177,000	None.			
Do.....	Arrowrock.....	2,860	280,000	402	247	15,000	40,000
Minidoka.....	Lake Walcott.....	11,350	150,000	2,385	42	40,000	60,000
Do.....	Jackson Lake.....	25,530	846,000	160	41	7,500	13,000
Montana:							
Milk River.....	St. Mary Lakes.....	6,910	124,000	500	20	500	20,000
Do.....	Sherburne Lakes.....	2,000	78,000	200	70	200	8,000
Do.....	Nelson Reservoir.....	6,020	132,000	(4)	435		
Do.....	Point of Rocks.....	180	830	740	8	0	700
Do.....	Beaver Creek.....	5,800	60,000	(1)	39	100	5,000
Do.....	Chain Lakes.....	5,855	90,000	Not designed.			
Sun River.....	Willow Creek.....	2,696	86,000	200	100	725	(1)
Do.....	Sun River Storage.....	3,540	269,000	580	321	14,000	46,000
Do.....	Pishkun Reservoir.....	1,542	45,700	Under control.			
Do.....	Muddy Creek.....	1,828	33,000		80	284	(1)
Do.....	Benton Lake.....	9,300	144,000	Under control.			
Nebraska - Wyoming:	Pathfinder.....	22,700	1,070,000	605	184	40,000	
North Platte:							
Do.....	Lake Alice.....	900	11,400	100	18	2,500	
Do.....	Lake Minatare.....	2,240	67,000	100	55	2,000	
Do.....	Winters Creek Lake.....	360	3,000	None.			
Nevada: Newlands.....	Lake Tahoe.....	120,000	120,000	85	6		
Do.....	Horseshoe Bend.....	760	50,500	(1)	(1)		
Do.....	Lahontan.....	12,000	290,000	500	112		30,000
New Mexico: Carlsbad.....	Avalon.....	970	7,000	1,026	21	86,000	
Do.....	McMillan.....	7,860	45,000	1,750	26.1-24.9	17,000	34,500
New Mexico - Texas: Rio Grande.....	Elephant Butte.....	40,080	2,638,000	275	193	8,000	16,000
Oregon: Umatilla.....	Cold Springs.....	1,500	50,000	330	90	6,000	6,000
Oregon - California: Klamath.....	Upper Klamath Lake.....	60,000	264,000	None.			
Do.....	Clear Lake.....	25,000	462,000	357	24	10,000	30,000
South Dakota: Belle Fourche.....	Belle Fourche.....	8,010	203,000	314	100	2,000	2,000
Do.....	Nine Mile.....	150	2,500	20	20	(1)	(1)
Utah: Strawberry Valley.....	Strawberry Valley.....	8,370	250,000	58	61	500	2,000
Washington:							
Okanogan.....	Salmon Lake.....	200	3,200	None.			
Do.....	Conconully.....	460	13,000	180	55	4,500	16,000
Yakima.....	Bumping Lake.....	1,350	34,000	235	36		6,000
Do.....	Lake Clealum.....	4,680	501,000	420	112		18,000
Do.....	Lake Kachess.....	4,800	210,000	250	53		7,200
Do.....	Tieton (McAllister Meadows).....	1,800	185,000	350	183		19,000
Do.....	Lake Keechelus.....	2,550	152,000	300	60		10,000
Do.....	Clear Creek.....	126	1,700	210	35		
Wyoming: Shoshone.....	Shoshone.....	6,600	456,600	300	233	11,000	30,000
Do.....	Ralston.....	200	2,100				
Do.....	Deaver.....	80		None.			
INDIAN PROJECTS.							
Montana:							
Blackfeet.....	Two Medicine Lake.....	854	16,000	66	254	350	6,000
Do.....	Spring Lake.....	1,400	29,000	50	45	0	900
Do.....	Four Horns.....	1,867	60,640	50	57	0	1,000
Do.....	Guardippee.....	1,110	22,600	170	40	0	840

¹ Undetermined.

² 53,500 acre feet only available; above fixed crest of spillway.

³ Average flow of stream on which reservoir is located.

⁴ No spillways; drainage limited; elevation is that of water surface.

⁵ Elevation above outlet.

Engineering data for projects when completed—Continued.

RESERVOIRS—Continued.

Projects.	Name.	Area.	Capacity.	Spillways.			
				Length.	Elevation above stream bed.	Capacity.	
						Normal.	Maximum.
		Acres.	Acro.-feet.	Feet.	Feet.	Sec.-ft.	Sec.-ft.
INDIAN PROJECTS—contd.							
Montana—Continued.							
Flathead	Big Draw	901	9,330	100	25	200	500
Do.	Dog Lake	180	3,200		30		
Do.	Dry Fork	250	2,000	250	25	500	1,500
Flathead	Flathead Lake	107,000	1,800,000	1,000	150	100,000	150,000
Do.	Horte	73	260	40	17	140	300
Do.	Hubbart	400	15,000	50	120	400	1,200
Do.	Kincklinghorse	675	6,800		23		
Do.	Little Bitter Root Lake	3,000	9,000		3		
Do.	Lower Crow Creek	300	9,485	100	32	600	1,500
Do.	McConnell	100	2,000		40		
Do.	McDonald Lake	220	10,600	200	51	3,000	6,000
Do.	Mission	300	8,300	100	74	1,200	3,000
Do.	Ninepipe	1,630	15,100		30		
Do.	Pablo	2,100	29,600		36		
Do.	Polson	70	1,700		60		
Do.	Tabor (St. Mary Lake)	300	25,000	50	52	400	1,200
Do.	Twin	70	937		25		
Fort Peck	Little Porcupine	390	3,900				
Do.	Big Porcupine	750	9,400	(*)			
Do.	Poplar River	3,700	50,000	(*)			
Do.	Wolf Creek	350	4,550	(*)			
Do.	Smoke Creek	300	5,300	(*)			
Total		578,204	13,279,912				

STORAGE DAMS.

Projects.	Name.	Type.	Maximum height.	Crest length.	Volume.
			Feet.	Feet.	Cubic yds.
Arizona: Salt River.	Roosevelt ¹	Rubble masonry arch, gravity.	280	1,125	342,325
California: Orland.	East Park ²	Concrete arch, gravity.	139	250	12,200
Colorado: Uncompahgre Valley.	Taylor Park	Undetermined.	(*)	(*)	(*)
Idaho:					
Boise	Upper Deer Flat	Earth fill.	70	4,000	1,190,275
Do.	Lower Deer Flat ³	do.	40	7,200	1,207,606
Do.	Deer Flat Forest	do.	16	950	22,500
Do.	Arrowrock ⁴	Rubble concrete arch, gravity.	349	1,100	585,130
Minidoka.	Minidoka ⁵	Rock fill, concrete core.	98	937	242,500
Do.	Jackson Lake ⁶	Massive concrete gate section and earth fill.	67	4,450	345,400
Montana:					
Milk River	St. Marys Lake	Earth embankment.	30	2,000	135,000
Do.	Sherburne Lakes ⁷	do.	78	2,000	215,000
Do.	Nelson Reservoir ⁸	do.	39	20,730	1,016,000
Do.	Point of Rocks ⁹	do.	12.5	2,680	31,000
Do.	Beaver Creek	do.	49	8,000	500,000
Do.	Connolly	do.	50	2,800	500,000
Sun River	Willow Creek ¹⁰	Earth fill.	110	1,045	452,000
Do.	Sun River Storage	Masonry.	329	989	296,050
Do.	Pishkun	Earth fill.	48	8,600	444,000
Do.	Muddy Creek	do.	90	800	440,000
Do.	Benton Lake	do.	40	240	12,000

¹ No spillways; drainage limited; elevation is that of water surface.² Undetermined.³ Completed.⁴ Not designed.⁵ Under construction.⁶ Completed to height of 11 feet, with storage of 25,000 acre-feet.⁷ Completed to height of 70 feet.

Engineering data for projects when completed—Continued.

STORAGE DAMS—Continued.

Projects.	Name.	Type.	Maximum height.	Crest length.	Volume.
			<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yds.</i>
Nebraska-Wyoming:	Pathfinder ¹	Broken range masonry arch	218	432	60,210
North Platte.					
Do.	Pathfinder Dike ¹	Earth fill	40	1,650	152,080
Do.	Dam No. 1 ¹	do.	30	3,100	240,000
Do.	Dam No. 1½ ¹	do.	23	2,550	119,000
Do.	Minatare ¹	do.	65	3,700	570,000
Nevada: Newlands.	Lake Tahoe ¹	Concrete sluiceway regulator	14	109	425
Do.	Horseshoe Bend.	Not designed.			
Do.	Lahontan ¹	Earth and gravel fill with concrete spillways.	124	1,400	770,008
New Mexico:					
Carlsbad.	Avalon ¹	Earth and rock fill, concrete core.	50	1,380	168,778
Do.	McMillan ¹	Earth and rock fill	55	2,070	150,744
New Mexico-Texas:	Elephant Butte ¹	Rubble concrete, gravity, straight structure.	306	1,674	605,200
Rio Grande.					
Do.	Elephant Butte Dike ¹	Earth fill	42	1,900	164,650
Oregon: Umatilla.	Cold Springs ¹	do.	98	3,800	789,500
Oregon - California:	Clear Lake ¹	Rock fill	33	790	56,600
Klamath.					
South Dakota: Belle Fourche.	Belle Fourche ¹	Earth fill	115	6,300	1,600,000
Do.	Nine Mile.	do.	28	1,400	50,800
Utah: Strawberry Valley.	Indian Creek Dike ¹	Earth fill, reinforced concrete	37	1,311	101,107
Do.	Strawberry Dam ¹	Earth fill, reinforced concrete core wall.	72	488	108,415
Washington:					
Okanagan.	Salmon Lake ¹	Concrete headworks.			
Do.	Conconully ¹	Hydraulic earth fill.	64	1,000	336,000
Yakima.	Bumping Lake ¹	Earth fill.	45	3,425	247,700
Do.	Lake Clealum.	Earth and gravel fill	125	700	462,000
Do.	Lake Kachess ¹	do.	63	1,400	193,300
Do.	Tieton ¹	Earth and rock fill	220	900	1,785,000
Do.	Lake Keechelus ¹	Earth and gravel fill	70	6,500	639,000
Do.	Clear Creek ¹	Single concrete arch	84	404	4,100
Wyoming: Shoshone.	Shoshone ¹	Rubble concrete arch	328	200	78,576
Do.	Ralston ¹	Earth fill.	50	150	24,740
Do.	Deaver ¹	do.	14	1,300	30,300
INDIAN PROJECTS.					
Montana:					
Blackfeet.	Two Medicine ¹	Earth embankment	36	900	28,600
Do.	Spring Lake.	do.	50	1,500	75,000
Do.	Four Horns ¹	do.	62	2,225	149,000
Do.	Guardpee.	do.	50	613	45,000
Flathead.	Big Draw.	Earth.	35	3,600	127,000
Do.	Dog Lake.	Loose rock and earth	35	2,250	67,000
Do.	Dry Fork.	Earth.	33	1,860	120,000
Do.	Newell.	Concrete.	170	860	100,000
Do.	Horte ¹	Earth fill.	16	980	3,800
Do.	Hubbart.	Loose rock and earth	118	450	302,000
Do.	Kickinghorse.	Earth.	31	3,700	181,000
Do.	Little Bitter Root.	do.	10	300	4,000
Do.	Lower Crow Creek.	do.	92	860	330,000
Do.	McConnell.	do.	45	1,130	71,000
Do.	McDonald Lake.	Loose rock and earth	57	1,500	214,000
Do.	Mission.	do.	80	2,500	346,000
Do.	Ninepipe ¹	Earth.	38	2,180	162,000
Do.	Pablo ¹	do.	46	14,000	1,028,000
Do.	Polson.	do.	85	1,100	170,000
Do.	Tabor.	Loose rock and earth	58	2,200	140,000
Do.	Twin.	Earth.	30	1,600	46,000
Fort Peck.	Little Porcupine ¹	Earth fill.	17	4,200	43,400
Do.	Big Porcupine.	do.	30	1,800	118,000
Do.	Poplar River.	do.	51	5,200	960,000
Do.	Wolf Creek.	do.	36		85,300
Do.	Smoke Creek.	do.	48		76,000
Total.					22,509,236

¹ Completed.² Including spillway.³ Including spillway, 611,000 cubic yards.⁴ Under construction.⁵ First development, 188,780; completed for 5,000 acre-feet when paved; now paved for 3,000 acre-feet.⁶ In process of being raised 21 feet.⁷ Completed, except automatic crest.⁸ First development, 18,000; completed for 4,000 acre-feet.⁹ First development, 64,191; completed for 5,000 acre-feet.

Engineering data for projects when completed—Continued.

DIVERSION DAMS.

Projects.	Name.	Type.	Maximum height.	Crest length.	Volume.
			<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yds.</i>
Arizona: Salt River	Granite Reef ¹	Rubble concrete weir	38	1,000	40,000
Do.	Power Canal ¹	do.	12½	400	4,800
Do.	Joint Head ¹	Concrete weir	10	600	1,740
Arizona - California: Yuma.	Laguna ¹	Indian weir, concrete and rock fill. ²	40	4,780	441,732
California: Orland	South Canal ¹	Concrete on piling, with rock fill.	20	900	2,886
Do.	North Side ¹	Concrete weir, with removable timber crest.	8	360	270
Do.	East Park Feed Canal. ¹	Concrete arch	44	154	1,777
Colorado:					
Grand Valley	Grand River Diversion. ¹	Masonry ogee weir with roller crest 10 to 15 feet high.	24	546	25,682
Uncompahgre Valley.	Gunnison ¹	Crib on rock fill and movable flashboards.	15½	237	3,200
Do.	Montrose and Delta ¹	Movable flashboard weir	6.8	68½	.....
Do.	Loutsenhizer ¹	Pile and timber weir	.....	100	.....
Do.	Selig ¹	Movable flashboard weir	6	95½	.....
Do.	Ironstone ¹	Pile foundation with deck and needle flashboards.	8½	58½	.....
Do.	East Canal ¹	Movable flashboard weir	(³)	144	.....
Do.	Garnet ¹	Rock basket and brush dam	.....	.....	.....
Idaho:					
Boise	Boise River ¹	Rubble concrete weir	45	246	21,750
Minidoka	Minidoka ¹	Combined diversion and storage dam. (See Storage.)	.....	.....	.....
Montana:					
Milk River	Swift Current ¹	Earth and timber crib	13	2,800	86,700
Do.	St. Mary ¹	Concrete	6.5	198	480
Do.	Chinook	Reinforced concrete	20	250	3,400
Do.	Dodson ¹	Timber crib, rock filled.	25	319	12,000
Do.	Vandalla ¹	Reinforced concrete	34	1,500	11,000
Sun River	Sun River ¹	Concrete masonry	132	212	6,200
Do.	Deep Creek	Reinforced concrete	12	100	500
Montana-North Dakota: Lower Yellowstone.	Lower Yellowstone ¹	Rock-filled, timber weir	12	700	14,500
Nebraska-Wyoming: North Platte.	Whalen ¹	Concrete weir	29	300	80,740
Nevada: Newlands	Truckee River ¹	16 concrete sluiceways	22	171	3,322
Do.	Carson River ¹	23 concrete sluiceways	21	240	2,707
New Mexico: Carlsbad.	Avalon ¹	Combined storage and diversion. (See Storage.)	.....	.....	.....
New Mexico-Texas: Rio Grande.	Leasburg ¹	Rubble concrete weir	10.8	600	2,413
Do.	Mesilla ¹	do. ⁴	16.7	303	2,876
Do.	Mexican ⁶	Rubble masonry	4.7	320	.....
Do.	Palomas	Not designed.	.....	.....	.....
Do.	Percha ¹	Rubble concrete	17	350	4,346
Oregon: Umatilla	Feed Canal (Echo) ¹	Concrete weir on timber crib	2½	400	296
Do.	Maxwell Canal ¹	do.	2.3	175	43
Do.	Three-Mile Falls ¹	Concrete multiple arch	24	800	4,160
Oregon - California: Klamath.	Lost River ¹	Hollow reinforced concrete.	40	280	5,550
South Dakota: Belle Fourche.	Diversion ¹	Concrete weir	28	400	12,149
Utah: Strawberry Valley.	Spanish Fork ¹	do.	16	70	1,262
Do.	Indian Creek Crossing ¹	Earth	17	1,300	15,183
Do.	Horse Creek Crossing ¹	do.	6	500	7,876
Do.	Diverting dam at Strawberry Dam. ¹	do.	6	100	1,146
Do.	Diverting dam at rating flume. ¹	do.	12	150	4,103
Washington:					
Okanogan	Salmon Creek ¹	Concrete weir	4½	50	132
Yakima	Sunnyside ¹	Concrete ogee weir	8½	500	2,291
Do.	Tieton Diversion ¹	Concrete and rock-filled crib	3	110	334
Wyoming: Shoshone.	Corbett ¹	Reinforced-concrete weir	18	400	4,951

¹ Completed.² Area formed by Laguna diversion dam, 6,400 acres.³ Two weirs, one 6 feet by 72 feet, the other 6 feet 10 inches by 72 feet.⁴ Length, including logway.⁵ With 6 foot 3 inch and 4 foot 6 inch tainter gate movable crest.⁶ Constructed by Mexican authorities and used jointly.

Engineering data for projects when completed—Continued.

DIVERSION DAMS—Continued.

Projects.	Name.	Type.	Maximum height.	Crest length.	Volume.
			<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yds.</i>
Montana:					
Blackfeet.....	Two Medicine.....	Brush and rock.....	4	165	175
Do.....	Blacktail ¹	Concrete.....	14	54	290
Do.....	Badger Birch and Cut Bank.....	Not yet designed.....			
Flathead.....	Jocko River.....	Log crib, rock filled ²			
Do.....	Little Bitter Root.....	do.....			
Do.....	Camas A. ¹	Arched masonry.....	25	125	500
Do.....	Mud Creek ¹	Concrete.....	12	18	116
Do.....	Crow Creek ¹	do.....	13	82	230
Do.....	Post Creek—Kicking-horse. ¹	Log crib, rock filled.....	7	110	1,500
Do.....	Post Creek—Pablo Feeder.....	do. ³			
Do.....	Mission Creek ¹	Log apron.....	3	80	
Do.....	Dry Creek.....	Log crib, rock filled ²			
Do.....	Finley Creek.....	do.....			
Do.....	Agency Creek.....	do.....			
Do.....	Big Knife Creek ¹	Concrete.....	5	6	25
Do.....	Valley Creek.....	Log crib, rock filled ²			
Do.....	Other small creeks.....	do.....			
Fort Peck.....	Little Porcupine ¹	Concrete weir on timber crib.....	4	150	250
Do.....	Poplar River ¹	do.....	4	300	180
Do.....	Big Porcupine ¹	do.....	6	150	185
Total.....					837,548

CANALS.

Projects.	Principal canals.			Mileage, with capacity in second-feet.				
	Name.	Maximum capacity.	Length.	Over 800.	300-800.	50-300.	Less than 50.	Total.
		<i>Sec.-ft.</i>	<i>Miles.</i>					
Arizona: Salt River.....	Power ¹	225	19	32	71	78	566	747
Do.....	Arizona ¹	2,000	22					
Do.....	South ¹	1,200	2					
Do.....	Consolidated ¹	1,000	7 ¹					
Arizona-Cal.: Yuma.....	Main ¹	1,700	12	17	12	100	430	559
Do.....	West Main.....	520	23					
Do.....	East Main.....	880	24 ¹					
California: Orland.....	East Park Feed ¹	250	7					
Do.....	North Main ¹	80	4.5			8	32	40
Do.....	South Main ¹	225	9.1			23	75	96
Colorado:								
Grand Valley.....	Main ¹	1,425	62	5	39	21	232	297
Uncompahgre.....	South ¹	1,300	12	11.5			41.2	52.7
Do.....	West ¹	120	22			12.4	24.3	36.7
Do.....	Montrose and Delta ¹	450	32		14.9	37.1	47.6	99.6
Do.....	Loutsenhizer ¹	125	15			12.3	8.4	20.7
Do.....	Selig ¹	300	20		3.5	20.2	54.7	78.4
Do.....	Ironstone ¹	350	18		6	22.5	53.8	82.3
Do.....	East ¹	325	11		3.4	14.9	39.8	58.1
Do.....	Garnet ¹	50	10			7.3	4.2	11.5
Idaho:								
Boise.....	Main South ¹	2,500	34	40	57	105	788	1,060
Do.....	Mora ¹	915	56					
Do.....	Deer Flat, Low Line ¹	780	37					
Do.....	King Hill.....	315	51.4					
King Hill.....	Main.....	315	51.4		6.5	35	9.9	51.4
Minidoka.....	North Side ¹	1,500	8	25	30	95	483	633
Do.....	South Side ¹	1,000	13					
Montana:								
Huntley.....	Main ¹	500	32	10	22	200	233	233
Do.....	Pumping High Line ¹	100	12					
Milk River.....	St. Mary ¹	850	29	29				29
Do.....	Dodson South ¹	900	44	44		66	130	240
Do.....	Dodson North ¹	200	20			23	37	60

¹ Completed.² Not yet designed.³ Under construction.

Engineering data for projects when completed—Continued.

CANALS—Continued.

Projects.	Principal canals.			Mileage, with capacity in second-feet.				
	Name.	Maximum capacity.	Length.	Over 800.	300-800.	50-300.	Less than 50.	Total.
Montana—Continued.		<i>Sec.-ft.</i>	<i>Miles.</i>					
Milk River.....	Vandalia South ¹	300	48			44	41	85
Do.....	Nelson Reservoir South ¹	260	27			26	59	85
Do.....	Chinook North.....	560	46		14	29	3	² 46
Do.....	Chinook South.....	200	18			14	4	² 18
Sun River.....	Fort Shaw ¹	175	12			18	108	121
Do.....	Pishkun ²	2,500	12	12				12
Do.....	Sun River Slope ⁴	1,000	25.4	25.4		74	286	404.3
Do.....	Greenfields ⁴	850	18.9	10.9	8			
Do.....	Other units.....				50	54	210	314
Montana-North Dakota:	Main ¹	830	66		49	19	190	258
Lower Yellowstone.								
Nbraska-Wyoming:	Interstate ¹	1,400	95	90	20	92	603	805
North Platte.								
Do.....	Fort Laramie.....	1,430	127	62	42	44	² 600	748
Nevada: Newlands.	Truckee ¹	1,600	31					
Do.....	V Line ¹	1,600	8					
Do.....	L Line ¹	1,210	14.5					
Do.....	S Line ¹	1,210	18.7	42	62	80	542	726
Do.....	D Line ¹	440	7					
Do.....	AA Line ¹	400	13.4					
Do.....	T Line ¹	400	9					
New Mexico:								
Carlsbad.....	Main ¹	450	² 3		13	12	120	145
Texas, Rio Grande.	Palomas.....	100	12					
Do.....	Arrey ¹	350	30					
Do.....	Garfield ¹	330	9.3					
Do.....	Hatch ¹	200	8.0					
Do.....	Rincon ¹	100	7.0					
Do.....	Leasburg ¹	485	10.8					
Do.....	Picacho Branch ¹	90	3.7					
Do.....	East Side ¹	240	10.3					
Do.....	West Side ¹	493	14.4					
Do.....	West Side Extension	270	9.3					
Do.....	Chamberino Feed ¹	70	2.2		67.8	128.5	27	223.3
Do.....	Franklin ²	450	31.4					
Do.....	San Elizario Feeder ¹	220	3.2					
Do.....	San Elizario main canal ²	270	3.5					
Do.....	Salatral ²	177	1.6					
Do.....	Montoya ¹	54	3.1					
Do.....	Juan d'Herrera ²	170	0.8					
Do.....	Island Feeder ¹	125	2.1					
Do.....	Tornillo.....	180	2.4					
North Dakota: North Dakota Pumping.	Bulford Trenton ¹	60	6			6	39	45
Do.....	Williston ¹	90	3			3	57	60
Oregon: Umatilla.	Feed ¹	350	25					
Do.....	West extension main	375	26.7		33	52	90	178
Do.....	Maxwell.....	140	8					
Oregon-California: Klamath.	Main ¹	1,400	9					
Do.....	Keno ¹	635	1					
Do.....	Lost River Diversion Channel.....	250	8	9	9	42	250	310
Do.....	East Branch ¹	260	4.5					
Do.....	South Branch ¹	205	13.2					
Do.....	Adams ¹	205	12					
Do.....	Griffith Lateral ¹	190	9					
South Dakota: Belle Fourche.	Inlet ¹	1,600	64					
Do.....	North Side ¹	700	45	7	55	105	146	312
Do.....	South Side ¹	300	40					

¹ Completed.² Main canals only.³ Completed to first development capacity of 1,000 second-feet.⁴ Completed to first development capacity of 500 second-feet.⁵ Estimated.⁶ Main and southern canals, 31 miles.⁷ 2.3 miles constructed.⁸ Old canal purchased by U. S. Reclamation Service. Reconstruction under way.⁹ Old canal purchased by U. S. Reclamation Service and reconstructed.

Engineering data for projects when completed—Continued.

CANALS—Continued.

Projects.	Principal canals.			Mileage, with capacity in second-feet.				
	Name.	Maximum capacity.	Length.	Over 800.	300-800.	50-300.	Less than 50.	Total.
Utah:		<i>Sec.-ft.</i>	<i>Miles.</i>					
Strawberry Valley..	Power 1.	500	3.3		3.3			3.3
Do.....	Trail Hollow 1.	125	4			4		4
Do.....	Indian Creek 1.	750	2		2			2
Do.....	High Line 1.	300	17.5			17.5		17.5
Do.....	Mapleton.	100	6.75			6.75		6.7
Do.....	Lateral 3 1.	30	2.2				2.2	2.25
Do.....	Lateral 20 1.	55	6.1			1.1	5	6.1
Do.....	Lateral 30 1.	66	8.5			3.5	5	8.5
Do.....	Lateral 31 1.	10						
Do.....	Lateral 32 1.	50	2.9			0.8	2.1	2.9
Do.....	Lateral 33.	150	2.2			2.2		2.2
Do.....	Lateral 34 1.	55	11.1			1.3	9.8	11.1
Do.....	Miscellaneous laterals and sublaterals.	12	31.4				31.4	31.4
Washington:								
Okanogan.....	Main 1.	110	2			10	69	79
Yakima.....	Sunnyside Main 1.	1,200	60	31	19	15	342	407
Do.....	Snipes Mountain 1.	160	13			10	42	52
Do.....	Rocky Ford 1.	100	13			1	29	30
Do.....	Manton 1.	110	14			8	44	52
Do.....	Benton Extension 1.	80	16			9	13	22
Do.....	Tieton 1.	300	12		12	32	291	335
Wyoming: Shoshone.....	Garland 1.	1,000	18	10.6	23.3	71.1	308.8	412.8
INDIAN PROJECTS.								
Montana:								
Blackfeet.....	Two Medicine.....	530	25					
Do.....	Fisher.....	500	30					
Do.....	Birch.....	45	6		55	144	600	799
Do.....	Cutbank North.....	250	30					
Do.....	Cutbank South.....	300	20					
Do.....	Four Horns Supply.....	275	12					
Flathead.....	Tabor Feeder.....	300	11					
Do.....	Pablo Feeder.....	300	44					
Do.....	Kickinghorse Feeder 1.	400	4		14	82	800	896
Do.....	Ninepipe Feeder.....	250	2					
Do.....	Pablo Lateral A 1.	400	17					
Do.....	Camas A.....	150	10					
Fort Peck.....	Little Porcupine 1.	250	1			1	13	14
Do.....	Poplar River B 1.	100				11	22	33
Do.....	Poplar River C 1.	100	29			18	48	66
Do.....	Big Porcupine 1.	100	7			7	25	32
Do.....	Missouri Gravity.....	625	100		10	30	60	100
Wyoming:								
Riverton.....	Wyoming.....	2,400	10	(?)	(?)	(?)	(?)	(?)
Total.....				503.4	814.7	2,098.45	9,389.2	12,805.75

TUNNELS.

Projects.	Name.	Length.	Capacity.
Arizona: Salt River.....	Power Canal: 1	<i>Feet.</i>	<i>Second-feet.</i>
	Intake.....	1,695	
	Lee.....	122	
	Wehri cut off—		
	No. 1.....	428	
	No. 2.....	129	
	No. 3.....	271	
	Wehri.....	151	
	Pinto.....	999	
	Chilton.....	1,027	
	Robinson.....	152	
	Gray.....	761	
	Moffet.....	214	
	Grapevine.....	872	
	No. 6.....	206	
	No. 7.....	342	
	No. 8.....	553	
	No. 9.....	320	

1 Completed.

2 Not designed.

Engineering data for projects when completed—Continued.

TUNNELS—Continued.

Projects.	Name.	Length.	Capacity.
Arizona: Salt River.....	Power Canal:		
	No. 10.....	489	
	No. 11.....	625	
	No. 12.....	70	
	No. 13.....	110	
	Roosevelt: ¹		
	Sluicing.....	480	
	Outlet.....	167	
	Penstock.....	620	
Arizona-California: Yuma.....	Colorado River siphon ¹	930	1,400
Colorado:			
Grand Valley.....	Main Canal:		
	No. 1 ¹	3,723	1,425
	No. 2 ¹	1,655	1,425
	No. 3 ¹	7,292	670
Uncompahgre.....	Gunnison ¹	30,646	1,000
	South Canal: ¹		
	No. 1.....	482	1,300
	No. 2.....	395	1,300
	No. 3.....	1,000	1,300
	No. 4.....	400	1,300
	No. 5.....	390	1,300
	West Canal ¹	1,750	100
	West Canal Extension ¹	800	30
	Lower Selig Extension: ¹		
	No. 1.....	160	140
	No. 2.....	360	140
	No. 3.....	100	100
	No. 4.....	310	100
Idaho: Boise.....	Penitentiary.....	322	10
	Arrowrock Logway ²	159	
Montana:			
Huntley.....	Main Canal:		
	No. 1 ¹	724	500
	No. 2 ¹	1,545	500
	No. 3 ¹	385	500
Sun River.....	Willow Creek ¹	639	725
	Sun River Storage.....	200	3,500
	Pishkun Canal:		
	No. 1 ¹	695	2,800
	No. 2 ¹	1,022	2,500
	No. 3 ¹	2,277	2,500
	Sun River Diversion Tunnel ¹	87	400
	Muddy Creek Reservoir.....	700	284
Nebraska-Wyoming: North Platte.....	Pathfinder: ¹		
	North ¹	480	6,000
	South ¹	360	6,400
	Drainage ¹	155	(¹)
	Auxiliary ¹	209	(¹)
	Crosscut ¹	55	(¹)
	Fort Laramie Canal:		
	No. 1.....	2,700	1,430
	No. 2.....	2,150	1,430
	No. 3.....	3,700	380
Nevada: Newlands.....	Truckee Canal:		
	No. 1 ¹	901	1,200
	No. 2 ¹	309	1,200
	No. 3 ¹	1,515	1,200
	Gilpin Spillway ¹	115	1,200
New Mexico: Carlsbad.....	Spillway: ¹		
	No. 1 ¹	97	8,000
	No. 2 ¹	103	8,000
	Spillway from Feed Canal ¹	34	450
Oregon: Umatilla.....	Main Canal ¹	3,200	1,200
Oregon-California: Klamath.....	South Canal.....	1,206	350
South Dakota: Belle Fourche.....	Strawberry ¹	19,997	600
Utah: Strawberry Valley.....	Strawberry Dam Sluicing.....	532	600
	Power Canal:		
	No. 1 ¹	900	500
	No. 2 ¹	705	500
	Hightline No. 1 ¹	227	300
Washington:			
Okanogan.....	Conconully outlet ¹	395	900
Yakima, Tieton.....	Steeple, No. 1 ¹	55	350

¹ Completed.² Not intended to carry water, but for the purpose of running logs which are carried over the dam and brought down through a cableway chute which ends in this tunnel.³ Completed to first development capacity of 1,000 second-feet.⁴ Not designed for discharge.

Engineering data for projects when completed—Continued.

TUNNELS—Continued.

Projects.	Name.	Length.	Capacity.
Washington—Continued.			
Yakima, Tieton.....	Steeple, No. 2 ¹	48	350
	Trail Creek ¹	3,120	300
	Columnar ¹	1,200	300
	Tieton ¹	2,729	300
	North Fork ¹	3,811	300
Wyoming: Shoshone.			
	Shoshone: ¹		
	Lower outlet.....	498	6,000
	Spillway.....	405	30,000
	Upper outlet.....	315	
	Corbett ¹	17,355	1,000
	Ralston Reservoir ^{1, 2}	245	
	Frannie ¹	1,330	317
	Shoshone Road: ¹		
	No. 1.....	39	
	No. 2.....	45	
	No. 3.....	14	
	No. 4.....	28	
	No. 5.....	136	
	No. 6.....	166	
	Highline Canal:		
	No. 1.....	4,497	600
	No. 2.....	247	600
	No. 3.....	2,100	600
	No. 4.....	835	600
	No. 5.....	265	600
	No. 6.....	2,025	600
	No. 7.....	290	560
	No. 8.....	283	560
	No. 9.....	120	380
	No. 10.....	185	335
	Willwood:		
	No. 1.....	560	300
	No. 2.....	365	300
INDIAN PROJECTS.			
Montana: Flathead.....	Newell ²	1,800	2,500
	Tabor Reservoir Outlet.....	1,620	400
	Pablo 31A ¹	441	200
	Camas A.....	1,100	150
Fort Peck.....	Missouri.....	4,300	625
Total.....		162,567	

IRRIGABLE AREA.

State, project, and unit.	Public land.			State land. ⁴	Indian land.	Private land.		Total.
	Entered.	Open.	With-drawn.			Rail-road.	Other.	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona: Salt River.....	16,170					175,907		192,077
Gravity system.....								183,077
Pumping system.....								9,000
Arizona-California: Yuma.....	7,500		37,506	1,800	8,500		54,700	110,000
California: Orland.....							20,533	20,533
North side.....							6,809	6,809
South side.....							13,404	13,404
Vested water rights.....							320	320
Colorado:								
Grand Valley.....	13,991	1,015	14,064				20,930	50,000
Gravity system.....	11,461	1,015	10,034				17,490	40,000
Pumping system.....	2,530		4,030				3,440	10,000
Uncompahgre.....	20,080	2,705	1,445				75,770	100,000
South Canal system.....	2,560	480	13				6,323	9,376
West Canal system.....	2,506	29	14				4,025	6,574
Montrose and Delta Canal system.....	5,685	299	7				23,213	29,204
Loutzenhizer Canal system.....	231	22					6,451	6,704

¹ Completed.² Ralston Reservoir tunnel is a sluicing tunnel for the settling basin of Corbett Tunnel.³ 1,703 feet driven. Completed for first development (unlined).⁴ Not all of this land remains unsold; a portion has passed into private ownership.

Engineering data for projects when completed—Continued.

IRRIGABLE AREA—Continued.

State, project, and unit.	Public land.			State land. ¹	Indian land.	Private land.		Total.
	Entered.	Open.	With-drawn.			Rail-road.	Other.	
Colorado—Continued.								
Uncompahgre—Continued.	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Selfe Canal system.....	3,908	1,230	1,311				7,408	13,909
Ironstone Canal system.....	1,228	97					16,721	18,046
East Canal system.....	3,959	548	100				8,901	13,508
Garnet Canal system.....	8						2,671	2,679
Idaho: Boise.....	67,452		3,160	1,859			268,791	337,562
Idaho: King Hill.....	9,034	372		1,071		459	5,449	16,335
Idaho: Minidoka.....	96,188	377		13			24,816	121,392
Montana: Huntley.....	26,460	838	1,525				3,967	32,885
First unit.....	23,906	932	684				3,133	28,666
Second unit.....	981						884	1,815
Third unit.....	1,573		841					2,414
Montana: Milk River.....	37,948		22,829	6,055	28,000		89,108	181,000
Dodson north canal.....	3,339		560	225			7,844	11,968
Dodson south canal.....	6,521		6,200	536			5,701	19,261
Bowdoin Canal.....	3,243		2,606	389			4,842	11,080
Beaver Reservoir canal.....	2,106		7,021	708			2,106	12,000
Neslon Reservoir south canal.....	10,190		2,220	1,640			8,050	22,100
Vandalia south canal.....	6,885		1,734	1,256			15,886	26,811
Chinook south canal.....	641		370	120	28,000		11,689	40,820
Chinook north canal.....	5,024		2,118	378			29,940	37,960
Montana: Sun River.....	55,641	437	39,626	12,034		260	66,622	174,630
Fort Shaw.....	10,951	437	446	154		260	2,642	14,920
Sun River slope.....	700		12,900	1,100			2,300	17,000
Greenfields and Mill Coulee.....	38,800		22,000	6,000			8,800	76,000
Greenfields Lake.....	5,460		4,280	1,120			4,140	15,000
Benton.....				1,520			19,480	21,000
Vaughn and Sunnyside.....				2,140			28,560	31,700
Montana-North Dakota: Lower Yellowstone.....	15,091	91	1,988	1,451		97	40,811	69,529
Nebraska-Wyoming: North Platte.....	114,632		35,610	11,909			89,564	251,715
Interstate unit.....	82,432		610	2,309			44,364	129,715
Nebraska.....	79,813		610	5,338			28,255	109,046
Wyoming.....	2,619						18,060	20,669
Units—								
North Platte Canal & Colonization Co.							17,837	17,837
First lateral district.....	33,035		337	2,128			4,124	39,624
Second lateral district.....	20,641		126	1,012			11,747	33,526
Third lateral district.....	28,758		147	2,198			7,627	38,728
Fort Laramie unit.....	25,700		34,600	8,300			38,600	107,000
Nebraska.....	8,560		7,200	4,000			32,100	61,860
Wyoming.....	17,150		27,300	4,200			6,500	65,150
Northport district, Nebraska.....	6,500		500	1,400			6,600	15,000
Nevada: Newlands.....	27,839	470	89,351			26,900	86,440	231,000
Carson division.....								18,000
Truckee division.....								22,000
Pyramid division.....								19,000
Upper Carson.....								39,000
New Mexico: Carlsbad.....	166						24,826	24,991
First.....	10						20,198	20,208
Second.....	166			1,220			2,833	4,399
Third.....							574	574
New Mexico-Texas: Rio Grande New Mexico.....	553		4,890	2,602		360	158,595	162,000
Texas.....	553		4,890	2,602			91,655	99,700
Units—								
Palomas Valley.....			574	119			6,807	7,500
Rincon Valley.....			256	1,867			16,677	18,800
Mezulla Valley, Leasburg unit.....	114		900	279			34,107	35,400
Mezulla Valley, other units.....	439		3,160	337			43,264	47,200
El Paso Valley.....						360	45,240	45,600
Formillo district.....							7,500	7,500

¹ Not all of this land remains unsold; a portion has passed into private ownership.² Including possible extensions.

Engineering data for projects when completed—Continued.

IRRIGABLE AREA—Continued.

State, project, and unit.	Public land.			State land. ¹	Indian land.	Private land.		Total.
	Entered.	Open.	With-drawn.			Rail-road.	Other.	
North Dakota: North Dakota	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
pumping.....	259	532		1,073			24,287	26,151
Bulford-Trenton.....	259	212		1,006			13,480	14,957
First division.....	259	212		91			3,420	3,982
Extensions.....				14			1,361	1,375
Upper bottom division.....				501			2,099	2,600
Lower bottom division.....							4,000	4,000
Trenton flat.....				400			2,600	3,000
Williston.....		320		67			10,807	11,194
First division.....		320		67			7,707	8,094
West bottom division.....							1,900	1,900
East bottom division.....							1,200	1,200
Oregon: Umatilla.....	5,078	294	2,398			3,342	25,188	36,300
First.....	386					320	6,262	6,968
Second.....	499	44				78	3,677	4,298
Third.....	1,249					919	1,789	3,957
Fourth.....	238	111				90	1,537	1,976
Fifth.....	189	18						207
Sixth.....	73	67				23	956	1,119
First, W. E.....	808					399	1,092	2,399
Second, W. E.....	1,279					265	1,404	2,948
Third, W. E.....	310	54				92	1,153	1,609
Future.....	47		2,398			1,156	7,318	10,919
Oregon-California: Klamath.....	2,691	59	27,300				111,394	141,444
Oregon.....	2,280	12	4,300				102,198	108,790
California.....	411	47	23,000				9,196	32,654
Units—								
First.....	85						29,196	29,281
Second.....							7,459	7,459
Third.....	2,606	59					3,268	5,933
Marginal lands (Tule).....			27,300				241	27,541
Sand Hollow.....							13,500	13,500
Horsefly.....							22,000	22,000
Pine Grove.....							3,730	3,730
Additional units.....							32,000	32,000
South Dakota: Belle Fourche.....	36,992	882	15,300	315			44,400	97,889
Utah: Strawberry valley.....	1,854	46					58,100	60,000
Washington: Okanogan.....							10,099	10,099
First.....							2,018	2,018
Second.....							6,085	6,085
Third.....							464	464
Old water rights.....							1,381	1,381
Town of Okanogan.....							151	151
Washington: Yakima.....	4,679			3,174			134,745	142,828
Sunnyside unit.....	2,627			1,158			107,043	110,828
Tieton unit.....	2,052			2,016		230	27,702	32,000
Wyoming: Shoshone.....	50,194	2,090	71,600	5,779		700	6,255	126,618
First unit.....								15,147
Second unit.....								14,898
Third unit.....								3,291
Fourth unit.....								6,201
Fifth unit.....								3,567
Sixth unit.....								13,015
Subsequent units.....								80,499

¹ Not all of this land remains unsold; a portion has passed into private ownership.

Engineering data for projects when completed—Continued.

IRRIGABLE AREA—Continued.

State, project, and unit.	Public land.			State land. ¹	Indian land.	Private land.		Total.
	En-tered.	Open.	With-drawn.			Rail-road.	Other.	
INDIAN PROJECTS.								
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Montana: Blackfeet.....	11,000		50,020		57,480			118,500
Cutbank North.....	11,000		4,320		4,680			20,000
Cutbank South.....			13,180		4,820			18,000
Two Medicine.....			19,120		24,880			44,000
Badger-Fisher.....			13,000		20,000			33,000
Birch.....			400		3,100			3,500
Montana: Flathead.....	41,125		5,320	* 9,635	* 77,420		990	134,500
Jocko.....	680		220	700	13,900			15,500
Mission.....	1,500		250	1,600	16,660		990	21,000
Post.....	11,300		1,700	2,900	13,100			29,000
Crow.....	700		50	100	13,150			14,000
Pablo.....	16,635		2,550	3,600	13,215			36,000
Polson.....	200		220	85	5,495			6,000
Big Arm.....	500		290	630	1,580			3,000
Camas.....	9,610		40	20	330			10,000
Montana: Fort Peck.....	9,713	107		80	141,360		740	152,000
Little Porcupine.....					2,530		80	2,610
Poplar River.....					28,210		480	28,690
Big Porcupine.....					3,920		80	4,000
Big Muddy.....					18,930			18,930
Missouri River.....					77,770			77,770
Galpin Bottom pumping.....	9,713	107		80			100	10,000
Milk River.....					10,000			10,000
Wyoming: Riverton.....			69,000		1,000		30,000	100,000
Total, all projects.....	666,983	10,409	494,327	58,850	317,715	32,348	1,631,376	3,212,008
Per cent.....	20.6	0.4	15.4	1.7	10.1	1.0	50.8	100.0

¹ Not all of this land remains unsold; a portion has passed into private ownership.² Unsold, 5,810 acres; privately owned, 3,825 acres.³ Allotments of deceased and incompetent Indians are sold at semiannual sales.

CROP STATISTICS.

Summary of crop reports on Government reclamation projects in 1918—areas (acres).

State and project.	Cereals.				Other grain and seed.				Hay and forage.												
	Barley.	Corn, In- dian.	Oats.	Rye.	Wheat.	Total.	Alfalfa seed.	Clover seed.	Sorghum (grain).	Flax seed.	Millet seed.	Total.	Alfalfa hay.	Clover hay.	Other hay.	Corn fodder.	Peas.	Other for- age.	Pasture.	Total.	
Arizona: Salt River.	9,274	955	1,174		6,650	18,033			19,405			19,405	63,137		3,596			291	44,002	110,926	
Arizona-California: Yuma.	425				460	885	4,577		4,118			8,695			593	216			2,342	12,060	
California: Orland.	1,257				80	1,337			3,014			3,014	5,614		859				3,225	9,968	
Colorado:																					
Grand Valley.	49	749	471		1,630	2,899							968		94	682		1,042	113	2,899	
Uncompahgre.	348	1,817	5,461	24	13,176	20,826	115	25				140	21,860	53	306	228	1	555	2,264	25,367	
Idaho:																					
Boise.	2,358	2,491	2,110	127	30,071	37,157	429	4,569	17			5,050	37,507	5,709	235	477		146	5,345	49,419	
King Hill.	6	38	22	3	125	194	2					2	1,106	25	15	13			72	1,232	
Mindoko.																					
Gravity unit.	698	338	2,996	151	9,013	13,196	284	1,228				6	28,593	796	216	55	100	13	4,523	34,296	
Pumping unit.	676	68	1,478	22	12,065	14,329	71	1,849				1,920	17,124	344	12	4	196	20	1,936	19,636	
Montana:																					
Huntley.	75	203	2,006		6,306	8,590	48	224				3	6,766	45	108				1,091	8,010	
Milk River.	307	59	1,374	30	4,968	6,738						623	2,696		11,432	18			2,195	16,341	
Sun River.	39	11	514		2,118	2,682	51	37				35	3,766	15	194			7	881	4,863	
Montana-North Dakota: Lower Yellowstone.	1,321	136	2,247	179	6,288	10,171	73					1,052	8,630		629	170			490	9,919	
Nebraska: Wyoming:																					
North Platte, interstate unit.	3,550	6,627	7,997	721	9,097	27,992	136	94				118	37,863		838	351		13	3,115	42,180	
N. P. C. & C. Co. lands.	132	731	778	8	579	2,449						4,866								4,866	
Fort Laramie unit.	353	12	2,063		876	3,716						479	1,108		468	12					
Nevada: Newlands.	1,374		44		5,024	6,442							25,267		1,124				9,662	36,053	
New Mexico: Carlsbad.	235	508	91		1,345	2,179	2,754		392			3,146	6,435		300				3,689	10,424	
New Mexico-Texas: Rio Grande.	428	10,175	697	85	11,651	23,036	83		376			460	28,867		387	583	10	660	1,932	32,439	
Oregon:																					
Umatilla.	48	252	1	33	31	365	117		4			121	5,274		348	114			774	6,330	
Klamath.	3,191		2,538	449	3,460	9,638							11,454		2,519				8,130	22,103	
South Dakota: Belle Fourche.	1,636	2,068	4,331	108	9,543	17,706	342					342	20,467		3,209	848			8,894	33,418	
Utah: Strawberry Valley.	533		1,768		10,244	12,981	31	90				121	7,882	26	648	15		46	1,788	10,400	
Washington:																					
Okanogan.		68			96	164							1,514			53			142	1,857	
Yakima.																					
Sunnyside unit.	547	6,301	130		3,639	10,617							36,516		1,575	889		786	4,067	43,833	
Tieton unit.	886	728	306		4,681	6,601							12,218	216		277	170		200	1,082	14,163
Wyoming: Shoshone—																					
Garland unit.	55	20	4,515		9,851	14,441	99	768				867	14,245	61	254				1,836	16,429	
Framme unit.	17	3	1,239	2	3,026	4,296	18					18	40		236				52	331	
Total.	29,668	34,944	46,951	1,943	163,138	276,673	9,231	8,884	27,326	1,710	642	47,793	419,612	7,260	30,340	5,234	308	3,779	113,637	687,309	

State and project.	Vegetables and truck.					Fruits and nuts.								
	Beans.	Onions.	Potatoes, white.	Potatoes, sweet.	Truck.	Total.	Apples.	Peaches.	Pears.	Prunes.	Citrus fruit.	Small fruit.	Miscellaneous.	Total.
Arizona: Salt River.	590		727		3,808	5,085					2,030	304	2,130	4,464
Arizona-California: Yuma.	28				160	188							46	46
California: Orland.			273		273	273				47	121	6	418	592
Colorado:														
Grand Valley.	238		295		111	554	512	70	115			14		711
Uncompahgre.	1,299	304	6,514		127	8,244	2,162	59	9	1		56		2,287
Idaho:														
Boise.	812	21	1,843	22	572	3,270	1,570	149	12	302		109		2,142
King Hill.	6		43		5	54	206	7				5		218
Minidoka—														
Gravity unit.	562	25	2,318		540	3,445						29		29
Pumping unit.	97	3	2,447		361	2,908						4		4
Montana:														
Huntley.	128		73		199	400								
Milk River.			67		30	97								
Sun River.	1		116		47	164								
Montana-North Dakota: Lower Yellowstone.	100		285		130	515								
Nebraska-Wyoming:														
North Platte, interstate unit.	1,800	27	6,293		347	8,377								
N. P. C. & Co. lands.			959			959								
Fort Laramie unit.	39		37		6	82								
Nevada: Newlands.			334		632	966								
New Mexico: Carlsbad.	36			10	25	71								
New Mexico-Texas: Rio Grande.	2,648	1	7	177	1,038	3,871	95	99	476					670
Oregon:														
Umatilla.			49		66	115	418	110	6	2		57		563
Klamath.			179		165	344							35	35
South Dakota: Belle Fourche.	146		227		421	794								
Utah: Strawberry Valley.	86		431		185	702	78	213		1		21		313
Washington:														
Okanogan.					99	169	3,846	29	27	5		3	14	3,924
Yakima—		1	44											
Sunnyside unit.	1,371		3,551		1,518	6,440	10,634	811	1,528	275		286		18,534
Tieton unit.	667	25	1,060		516	2,268	6,600	448	1,276			88		8,412
Wyoming: Shoshone—														
Garland unit.	21		588		231	840								
Framme unit.	51		34		23	108								
Total.....	10,711	407	28,333	209	11,635	51,294	26,121	1,995	3,449	633	2,151	987	2,643	37,979

Summary of crop reports on Government reclamation projects in 1918—acres (acres)—Continued.

State and project.	Miscellaneous.				Dupli- cated acres.	Total cropped.	Irrigated; no crop.					Total Irrigat- ed.
	Beets, sugar.	Cotton.	Cane.	Other.	Total.		Young alfalfa.	Young fruit.	Fall plow- ing.	Miscel- laneous.	Dupli- cated.	
Arizona: Salt River.....		50,107			50,107	23,608				21,184		205,616
Arizona-California: Yuma.....		28,608		42	28,650	6,495				621		45,670
California: Orland.....		172			172	3,011	712	1,753		773	549	14,764
Colorado:												
Grand Valley.....	1,042			2,155	3,197	3,873	700	57	1,658		700	8,102
Uncompangre.....	1,063			148	1,211	685	3,631	183	2,528		5,662	58,270
Idaho:												
Boise.....	2		5	329	336	6,654	7,014	507	2,281	1,200	6,648	95,074
King Hill.....			1		1	24	24	94	55	9		1,849
Mildoke.....												
Gravity unit.....	2,448			2,029	4,477	291	3,481	624			479	60,296
Pumping unit.....	2,284			480	2,764	4	1,500	240	727	2,069	1,263	44,765
Montana:												
Huntley.....	1,963		24		1,987							19,262
Milk River.....							1,211				168	24,843
Sun River.....										11		17,569
Montana-North Dakota: Lower Yellowstone.....	500			65	565	1,265				75		21,076
Nebraska-Wyoming:												
North Platte, Interstate unit.....	6,391			20	6,411							86,771
N. P. C. & C. Co. lands.....	350			522	872							9,137
Fort Laramie unit.....												4,865
Nevada: Newlands.....						1,971				821		42,311
New Mexico: Carlsbad.....		7,147		9,018	16,065	14,313	18,200			1,260		19,400
New Mexico-Texas: Rio Grande.....	5	608	3,735	1,286	5,634	2,108	64,002	25	434	320		64,781
Oregon:												
Umatilla.....			7	58	65	970	1,548	427	83	326	113	9,100
Klamath.....	7				7					1,141		33,268
South Dakota: Belle Fourche.....	1,087			312	1,399	1,214						52,445
Utah: Strawberry Valley.....	5,273				5,273	2				2,751		32,539
Washington:												
Okanogan.....				27	27	854	38	918		162	3	6,402
Yakima.....												
Sunnyside unit.....												
Tieton unit.....	4,074			130	4,204	8,163	3,082	432		12,302	1,631	84,630
Wyoming: Shoshone—	235			31	266	5,865	1,150	745		320	1,660	26,400
Garland unit.....												
Framme unit.....	388			52	440	57	32,900	68	379	123	1,762	33,522
Framme unit.....	1				1	18	1,784	1	390	36	1,554	4,730
Total.....	27,133	86,470	4,300	16,826	134,729	80,476	1,081,193	34,900	6,438	47,841	28,928	1,119,564

* Figures for Sun River project are for 187 irrigated farms, which included 274 acres cropped without irrigation and 11 acres irrigated, but not cropped.

Summary of crop reports on Government reclamation projects in 1918—Total crop values.

State and project.	Cereals.						Other grain and seed.					
	Barley.	Corn, Indian.	Oats.	Rye.	Wheat.	Total.	Alfalfa seed.	Clover seed.	Scr- ghum. (grain).	Flax- seed.	Millet seed.	Total.
Arizona: Salt River.....	\$459,087	\$63,507	\$69,196	.....	\$490,751	\$1,072,540	.....	.....	\$1,387,457	.....	.....	\$1,387,457
Arizona-California: Yuma.....	17,292	.....	.....	.....	18,664	35,956	.....	.....	181,361	.....	.....	181,361
California: Orland.....	84,220	.....	.....	.....	4,074	88,294	.....	.....	157,331	.....	.....	157,331
Colorado:												
Grand Valley.....	655	31,774	10,522	.....	43,097	86,048	.....	.....	.....	.....	.....	.....
Uncompahgre.....	18,077	86,976	194,844	413	667,552	967,862	.....	.....	.....	.....	.....	.....
Idaho:												
Boise.....	87,489	224,245	58,136	1,091	1,346,070	1,717,631	4,380	\$1,063	524	.....	.....	5,443
King Hill.....	12	862	97	.....	1,846,070	1,846,070	50	.....	.....	.....	.....	.....
Gravity unit.....	31,208	18,509	92,629	4,070	445,987	592,378	.....	.....	.....	.....	.....	.....
Mindoka— Pumping unit.....	26,949	774	50,645	180	581,991	600,539	2,102	146,830	.....	.....	.....	147,632
Montana:												
Huntley.....	1,853	5,381	57,899	.....	288,616	353,749	2,170	3,968	.....	.....	280	6,408
Milk River.....	2,746	1,247	18,501	637	86,617	109,848	150	.....	.....	4,121	.....	4,271
Sun River.....	1,194	1,249	13,135	.....	58,183	72,742	2,623	2,610	.....	.....	.....	5,596
Montana-North Dakota: Lower Yellowstone— Nebraska-Wyoming: North Platte— Interstate unit.....	26,748	5,811	57,760	1,610	199,560	291,488	4,879	.....	.....	29,436	.....	34,315
N. P. C. & C. Co. lands.....	116,688	178,978	135,192	10,454	252,895	694,207	1,100	3,900	.....	.....	926	5,926
Fort Laramie unit.....	11,760	17,870	12,266	223	15,797	57,917	.....	.....	.....	.....	12,162	12,162
Nevada: Newlands.....	38,190	4,806	21,018	.....	17,260	40,186	.....	.....	.....	.....	.....	.....
New Mexico: Carlsbad.....	2,635	12,517	1,068	.....	17,840	21,750	.....	.....	19,430	.....	.....	80,611
New Mexico-Texas: Rio Grande.....	19,820	446,747	25,586	2,720	829,174	1,326,067	61,181	.....	11,386	.....	25	13,431
Oregon:												
Umatilla.....	765	9,796	16	376	997	11,940	6,363	.....	200	.....	.....	6,563
Klamath.....	51,075	.....	44,847	5,025	74,718	176,665	.....	.....	.....	.....	.....	.....
South Dakota: Belle Fourche.....	40,773	61,362	83,946	1,880	293,085	499,043	3,268	.....	.....	.....	.....	3,268
Utah: Strawberry Valley.....	32,563	12,266	53,768	.....	419,400	517,996	480	9,662	2,079	.....	.....	12,201
Washington:												
Okanogan.....	.....	2,640	.....	.....	499	3,139	.....	.....	.....	.....	.....	.....
Yakima— Sunnyside unit.....	23,190	441,070	5,200	.....	145,560	614,960	.....	.....	.....	.....	.....	.....
Tieton unit.....	26,876	45,768	8,499	.....	196,980	278,137	.....	.....	.....	.....	.....	.....
Wyoming: Shoshone— Garland unit.....	2,668	1,172	181,790	60	430,168	565,798	945	28,280	.....	.....	.....	29,175
Framble Unit.....	200	70	26,427	.....	76,510	106,267	60	.....	.....	.....	.....	69
Total.....	1,074,768	1,674,496	1,176,413	29,741	7,164,646	11,120,064	507,796	680,865	1,769,718	33,920	15,975	2,943,264

Summary of crop reports on Government reclamation projects in 1918—Total crop values—Continued.

State and project.	Hay and forage.						Vegetables and truck.							
	Alfalfa hay.	Clover hay.	Other hay.	Corn fodder.	Peas.	Other forage.	Pasture.	Total.	Beans.	Onions.	Potatoes, white.	Potatoes, sweet.	Truck.	Total.
Arizona: Salt River.....	\$4,412,625		\$227,607	\$5,515		\$14,550	\$890,040	\$5,544,822	\$59,400		\$99,275		\$924,868	\$1,093,543
Arizona-California: Yuma.....	665,322		13,234				44,848	628,919	1,356				13,956	15,312
California: Orland.....	394,000		21,600				18,835	424,435					24,215	24,215
Colorado:														
Grand Valley.....	48,643		2,174	9,373		6,252	557	66,999	17,641		17,833		11,770	47,244
Uncompahgre.....	797,409	\$856	6,230	3,289	\$90	39,279	27,171	874,294	80,797	\$49,045	969,222		11,967	1,101,061
Idaho:														
Boise.....	2,267,857	180,821	4,682	17,763		13,214	103,503	2,557,840	66,529	2,824	363,298	\$1,087	44,350	478,088
King Hill.....	36,452	675	300	90			1,440	38,857	6		1,366		50	1,422
Minden.....	1,465,942	25,987	2,188	2,184	4,549	1,295	103,374	1,608,519	28,279	1,464	380,469		49,756	409,968
Gravity unit.....	736,862	10,621	720	100	6,751	800	33,381	789,265	8,645	390	249,449		26,711	284,398
Montana:														
Huntley.....	206,712	1,490	1,650				10,888	220,440	4,320		6,616		15,770	26,706
Milk River.....	106,174		151,022	496			26,340	283,041			8,474		3,082	11,566
Sun River.....	139,061	300	3,114			700	6,695	149,890	183		10,574		6,833	17,470
Montana-North Dakota: Lower Yellowstone.....	236,544		10,860	6,820			6,865	261,069	5,880		26,880		11,966	44,766
Nebraska-Wyoming:														
North Platte—														
Interstate unit.....	967,269		8,790	3,352		1,197	40,545	921,153	59,098	2,470	621,574		14,905	698,047
N. P. C. & C. Co. lands.....	122,772							122,772			70,475		70,475	
Fort Laramie unit.....	3,960		3,960	32				4,028	1,435		2,660		465	4,660
Nevada: Newlands.....	1,283,984		16,184				56,279	1,326,447			38,125		44,120	82,245
New Mexico: Carlsbad.....	310,474		2,235				64,114	367,623	668		3,120		1,350	5,168
New Mexico-Texas: Rio Grande.....	2,064,847		26,579	18,790	600	27,720	27,883	2,166,919	108,621	60	1,082	17,731	104,743	232,067
Oregon:														
Umatilla.....	340,088		3,639	5,463			10,008	349,187			4,397		6,324	10,921
Klamath.....	632,100		52,020				40,660	724,770			21,260		6,991	27,941
South Dakota: Belle Fourche.....	604,384		64,980	15,072			61,879	686,315	6,556		21,042		17,618	45,216
Utah: Strawberry Valley.....	841,298	1,480	11,145	396		3,922	14,225	372,405	3,522		49,947		11,696	65,165
Washington:														
Okanogan.....	55,700		5,000	810			2,620	64,130	759	148	4,870		13,925	19,702
Yakima—														
Sunnyside unit.....	3,454,440		108,960	26,670		77,814	101,675	3,764,549	78,970		598,868		289,806	917,844
Tieton unit.....	817,240	9,260	8,130	4,745		26,008	27,060	894,413	47,455	9,960	156,668		70,660	284,768
Wyoming: Shoshone—														
Garland unit.....	381,370	2,975	3,867	3,570			40,208	381,990	994		108,380		22,878	182,262
Frammie unit.....	1,020		3,770	1,102			201	5,098	408		2,614		2,165	5,167
Total.....	22,720,090	184,465	767,385	127,864	11,960	214,761	1,780,969	26,757,424	681,642	66,361	3,775,503	21,068	1,701,289	6,146,788

State and project.	Fruit and nuts.						Miscellaneous.							
	Apples.	Peaches.	Pears.	Prunes.	Citrus fruit.	Small fruit.	Miscellaneous.	Total.	Beets, sugar.	Cotton.	Cane.	Other.	Total.	Total.
Arizona: Salt River.....					\$540,046	\$76,084	\$630,075	\$1,246,205		\$7,854,223			\$7,854,223	\$18,188,909
Arizona-California-Yuma.....							5,558	5,558					\$47,550	\$5,005,132
California: Orland.....					4,900	645	43,652	50,247		3,810,280		8,660	8,660	8,709,172
Colorado:														
Grand Valley.....						1,000		94,894				6,385	119,325	414,319
Uncompaggre.....	\$53,714	\$22,830	\$17,150	50		8,988	38,203	241,963		\$112,940			111,832	3,302,469
Idaho:														
Boise.....						7,853		59,284	200		\$204	15,765	16,169	5,154,646
King Hill.....	40,947	5,587	312	4,565		186		3,263			20		20	45,583
Mindoko.....	3,068													
Gravity unit.....						1,325		1,325		287,957			291,405	3,044,790
Pumping unit.....						727		727		240,760			240,760	2,123,318
Montana:														
Huntley.....														
Milk River.....														
Sun River.....						165		165			670		163,660	750,982
Montana-North Dakota: Lower Yellow-stone.....													408,713	408,713
Nebraska: Wyoming.....													246,382	246,382
North Platte.....												6,780	37,563	669,191
Interstate unit.....														
N. P. C. & C. Co. lands.....													25	781,278
Fort Laramie unit.....													27,112	313,064
Nevada: Newlands.....														61,815
New Mexico: Carlsbad.....														1,626,142
New Mexico-Texas: Rio Grande.....	5,450	9,189	125,340							491,937	13,750	106,225	611,902	1,105,615
Oregon:										37,000	270,932	51,440	359,347	4,237,030
Umatilla.....						3,140		8,787						
Klamath.....	3,322	1,135	890	300							764	2,490	3,254	400,642
South Dakota: Belle Fourche.....							25	25					330	929,131
Utah: Strawberry Valley.....														
Washington:	9,042	42,987		150		17,062		69,281				5,866	101,233	1,276,115
Okanogan.....														
Yakima.....	647,194	3,190	5,060	2,430		607	1,445	659,926	2			3,083	3,083	749,983
Sunnyside unit.....														
Tieton unit.....	1,021,172	61,425	419,318	146,526		57,200		1,705,641	203,700			7,168	210,868	7,213,392
Wyoming: Shoshone.....	833,480	70,951	96,744			26,067		1,030,242	22,500			6,200	28,700	2,516,261
Garland unit.....														
Frame unit.....									60,780			775	61,555	1,370,699
Total.....	2,809,129	219,229	668,956	161,071	544,946	200,978	718,968	5,323,287	2,731,871	12,198,480	286,340	318,952	15,830,943	66,821,306

Summary of crop reports on Government reclamation projects in 1918—Total yields.

State and project.	Cereals.						Other grain and seed.						Hay and forage.					
	Bar- ley.	Corn, Indian.	Oats.	Rye.	Wheat.	Total.	Al- falfa seed.	Clo- ver seed.	Sor- ghum (grain).	Flax- seed.	Mil- let seed.	Total.	Alfalfa hay.	Clo- ver hay.	Other hay.	Corn fed- der.	Peas.	Other for- age.
	Bush.	Bushels.	Bushels.	Bush.	Bushels.	Bushels.	Bush.	Bush.	Bushels.	Bush.	Bush.	Bushels.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Arizona: Salt River.....	371,000	33,600	61,600		227,200	683,400			752,000			752,000	220,000	14,402		540	2,910	
Arizona-California: Yuma.....	12,050				9,340	21,300	28,170		174,300			202,500	28,000	1,975		540		
California: Orland.....	34,200				1,850	36,070			87,400			87,400	24,000	1,200				
Colorado:																		
Grand Valley.....	395	17,340	10,300		22,740	50,775						420	2,710	152		1,527		
Uncompahgre.....	11,000	56,920	191,900	266	342,560	601,736	350	70					72,025	80		537	1,179	20
Idaho:																		
Boise.....	57,400	98,480	56,570	900	722,450	985,890	1,600	17,650	330		470	20,080	163,470	10,810	414	2,906		1,945
King Hill.....	8	550	100		500	1,158							3,110	45		30	10	
Minidoka.....																		
Montana:																		
Gravity unit.....	22,200	11,570	92,630	2,140	241,060	369,690	1,000	6,060			30	7,180	112,760	2,000	220	219,1,896	186	
Pumping unit.....	19,250	480	50,640	95	314,900	385,055	220	6,615			70	6,835	56,080	815	50	102,816	160	
Huntley.....	1,880	4,260	73,080		138,300	217,520	180	355				605	17,200	120	140			
Milk River.....	4,225	900	28,460	490	44,890	78,955	10					1,300	5,840		6,200	33		
Sun River.....	987	120	13,250		30,620	44,977	220	174				514	6,920	15	133		70	
Montana-North Dakota: Lower Yellow- stone.....	29,720	4,470	72,200	1,150	99,280	206,820	290					9,210	14,780		775	620		
Nebraska: Wyoming:																		
North Platte Interstate unit.....	106,080	119,319	168,990	8,363	133,103	535,855	110	390			615	1,115	96,713		879	838		171
N. P. C. & Co. lands.....	10,601	11,913	15,333	180	8,314	46,431							9,444					
Fort Laramie unit.....	90	3,205	17,865		7,505	28,695						14,635			396	8		
Nevada: Newlands.....	35,333	1,812	1,812		96,800	135,945							78,374		1,156			
New Mexico: Carlsbad.....	1,860	7,125	1,238		12,171	22,392	7,610		9,335			16,945	12,679		268			
New Mexico-Texas: Rio Grande.....	9,910	239,915	32,720	1,360	385,370	669,275	170		4,510		20	4,700	79,568		1,340	1,512	100	4,620
Oregon:																		
Umatilla.....	555	6,400	16	175	449	7,595	590					735	19,000		410	778		
Klamath.....	44,413	43,830	46,716	3,349	38,317	132,796			145				31,600		2,000			
South Dakota: Belle Fourche.....	40,775	9,068	137,066	1,502	152,670	375,843	360					360	42,032		3,610	1,861		
Utah: Strawberry Valley.....	22,613		53,768		233,000	318,464	40	923				993	18,961	70	743	79		401
Washington:																		
Okanogan.....		1,760			258	2,018							2,228		200	80		
Yakima.....																		
Summyside unit.....	15,440	315,050	5,200		72,780	408,470							157,020		4,725	4,445		8,946
Tieton unit.....	21,500	31,374	10,024		99,490	162,888							40,862	370	406	949		3,112
Wyoming: Shoshone—																		
Garland unit.....	2,128	596	131,732		228,813	363,266	95	2,823				2,918	31,257	175	227	210		
Framme unit.....	1,160	35	26,427	49	41,760	68,422	5					5			190	6		
Total.....	376,070	1,017,190	1,300,410	20,019	708,170	921,850	41,100	26,000	1,028,040	10,330	15,840	1,130,370	1,318,780	14,500	42,200	13,110	4,830	25,680

State and project.	Vegetables and truck.				Fruit and nuts.							Miscellaneous.			
	Beans.	On-ions.	Pota- toes, white.	Pota- toes, sweet.	Apples.	Peaches.	Pears.	Prunes.	Citrus fruit.	Small fruit.	Miscella- neous.	Total.	Beets, sugar.	Cotton.	Cane.
Bush.	Bush.	Bush.	Bush.		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Tons.	Pounds.	Tons.
Arizona: Salt River.....	12,000		66,180		2,753,930	592,210	645,290		13,501,160	1,000,000	21,302,500	35,803,660		47,601,400	
Arizona-California: Yuma.....	410				10,573,490	35,560	27,360	1,500			1,100,000	100,000		10,854,500	
California: Orland.....								70,500	70,000	6,450	324,200	471,150			
Colorado:															
Grand Valley.....	2,970		19,465		2,753,930	592,210	645,290			25,500		3,996,930	11,295		
Uncompahgre.....	19,210	96,250	1,170,175		10,573,490	35,560	27,360	1,500		112,180		10,750,090	11,145		
Idaho:															
Bose.....	20,060	2,230	331,660	304	1,413,400	127,170	3,040	92,300		137,060		1,773,570	20		16
King Hill.....					94,550							94,550			3
Mindoka.....	1		700												
Gravity unit.....	6,720	610	440,620							26,490		26,490	26,800		
Pumping unit.....	2,106	260								36,330		36,330	24,075		
Montana:													16,300		67
Huntley.....	955		9,610												
Milk River.....			7,060												
Sun River.....	20		17,570							310		310			
Montana-North Dakota: Lower Yellow- tone.....	840		35,840												
Nebraska-Wyoming:													3,310		
North Platte interstate unit.....	13,133	1,235	1,035,956										72,684		
N. P. C. & Co. lands.....			117,459										3,226		
Fort Laramie unit.....	319		4,434												
Nevada: Newlands.....			50,833												
New Mexico: Carlsbad.....	144		1,040												
New Mexico-Texas: Rio Grande.....	23,964	35	2,000,17,576		238,090	214,320	3,991,115					4,443,525	35	1,808,640	835
Oregon:														148,000	18,000
Umatilla.....															
Klamath.....			3,295		103,800		23,425	6,000				133,225			
South Dakota: Belle Fourche.....	1,561		19,318										55		
Utah: Strawberry Valley.....	587		23,390										10,603		
Washington:			49,947		361,700	1,432,900		5,000		189,800		1,989,400	60,520		
Okanogan.....															
Yakima.....	115	60	3,896		14,382,080	124,000	161,720	81,000		9,200	51,620	14,809,620			
Sunnyside unit.....	21,936		748,594		34,039,060	1,535,620	11,980,500	3,256,130				50,811,300	20,370		
Tieton unit.....	13,180	4,980	195,866		33,339,150	1,680,100	4,433,060			260,270		40,612,570	2,250		
Wyoming: Shoshone— Garland unit.....															
Franklin unit.....	249		127,447										4,422		
Total.....	100		3,075										10		
Total.....	141,150	98,660	4,494,370	18,920	97,299,240	6,612,480	21,265,600	3,512,430	13,571,160	1,803,560	21,778,320	165,842,720	287,130	60,412,640	18,980

† Estimated roughly.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. Franklin Knight Lane, Secretary of the Interior.
Alexander T. Vogelsang, First Assistant Secretary.
Selden G. Hopkins, Assistant Secretary.
Charles D. Mahaffie, Solicitor for the Interior Department.
John W. Hallowell, Assistant to the Secretary.
Herbert Kaufman, Special Assistant to the Secretary.
E. J. Ayers, chief clerk.
Brig. Gen. William L. Marshall, United States Army, retired, consulting engineer to the Secretary.
Arthur Powell Davis, Director and Chief Engineer of the Reclamation Service.
Will R. King, Chief Counsel of the Reclamation Service.
H. T. Cory, in charge of drainage and cut-over land investigation, Southern States, for the Reclamation Service.
F. W. Hanna, in charge of drainage and cut-over land investigation, Northern States, for the Reclamation Service.
Elwood Mead, in charge of settlement problems, Reclamation Service.
Clay Tallman, Commissioner of the General Land Office.
Cato Sells, Commissioner of Indian Affairs.
Gaylord M. Saltzgaber, Commissioner of Pensions.
James T. Newton, Commissioner of Patents.
Philander P. Claxton, Commissioner of Education.
George Otis Smith, Director of the Geological Survey.
Van. H. Manning, Director of the Bureau of Mines.
Stephen T. Mather, Director of the National Park Service.
Col. F. Mears, Chairman Alaskan Engineering Commission.

U. S. RECLAMATION SERVICE.

WASHINGTON OFFICE.

Office of the director and chief engineer: Morris Bien, assistant to the director; J. B. Beadle, secretary to the director; C. J. Blanchard, statistician; Hugh A. Brown, editor Reclamation Record; E. C. Bebb and C. A. Bissell, engineers; J. H. Pellen, chief draftsman; F. L. Cavis, chief accountant; A. H. Gullickson, western district, Yakima, Wash., C. E. Piatt, southern district, Denver, Colo., F. G. Hough, northern district, Helena, Mont., examiners of accounts; C. A. Lyman, chief of repayment accounts section; C. E. Harris, auditor of transportation accounts; Mrs. J. T. Davis, chief of auditing section; C. H. Fitch, chief clerk; C. N. McCulloch, chief of mails and files section; Emmet Carr, purchasing agent; Harry Caden and Miss H. A. Fellows, fiscal agents; T. E. Brown, chief of stenographic section; G. W. Numbers, appointment clerk.
Office of the assistant to the director: D. H. Sibbett, counsel; J. E. Golladay, Mrs. G. B. Mathiot and Alfred Dresser, assistant counsel; Mrs. E. W. Ballard, clerk.
Office of the chief counsel: Ottamar Hamel, assistant to the chief counsel, Geo. A. Ward, and E. W. R. Ewing, counsel.

DENVER OFFICE.

F. E. Weymouth, chief of construction, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chiefs of construction; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; E. A. Moritz, office engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; S. E. Hedden, disbursing officer.

FIELD OFFICES OF CHIEF COUNSEL.

Denver, Colo.—Law section office of chief of construction: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel. Office of irrigation district organization: E. W. Burr, district counsel; also in charge North Platte and Belle Fourche project. Office of land titles: E. H. Peery, district counsel.

El Paso, Tex.—P. W. Dent, district counsel; T. F. Fly, assistant district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Los Angeles, Calif.—O. P. Morton, district counsel; R. M. Patrick, assistant district counsel, located at Fallon, Nev. Projects: Salt River, Yuma, Orland, and Truckee-Carson.

Portland, Oreg.—H. L. Holgate, district counsel; R. J. Coffey, assistant district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont.; H. D. Padgett, assistant district counsel, Billings, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—Henry A. Cox, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel; A. G. Pollock, assistant district counsel, located at Provo, Utah. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

PROJECT ORGANIZATION.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association: W. R. Elliott, project manager, Phoenix, Ariz.

Yuma Project.—W. W. Schlect, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; Frank Nivens, chief clerk; E. M. Philebaum, fiscal agent.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Uncompahgre Valley Project.—F. D. Pyle, project manager, Montrose, Colo.; A. H. Peach, chief clerk; C. B. Funk, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; C. C. Fisher, engineer; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; R. B. Smith, chief clerk; R. H. Slaughter, fiscal agent.

Minidoka Project.—Barry Dible, project manager, Burley, Idaho; F. A. Banks, engineer; Dudley Pringle, chief clerk; Miss A. J. Larson, fiscal agent.

Huntley Project.—R. H. Fifield, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk and fiscal agent.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. R. Schepelmann, chief clerk; J. T. M. Culbertson, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; W. A. Meyer, chief clerk; F. H. Shiner, fiscal agent, Browning, Mont.

Sun River Project.—G. O. Sanford, project manager, Fort Shaw, Mont.; H. W. Johnson, chief clerk; A. W. Cook, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; J. C. Doubt, chief clerk and fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; O. K. Barnes and E. Z. Christeson, fiscal agents.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk; M. T. Murray, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melas, fiscal agent.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; C. H. Young, chief clerk and fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; C. C. Hogue, chief clerk; E. V. Hillius, fiscal agent.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; J. C. Counter, irrigation manager; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Strawberry Valley Project.—J. L. Lytel, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. F. Kubach, chief clerk and fiscal agent.

Yakima Project.—R. K. Tiffany, project manager, Yakima, Wash.; C. E. Crownover and G. C. Finley, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.

Shoshone Project.—A. H. Ayers, project manager, Powell, Wyo.; C. M. Jump, superintendent of irrigation; G. A. Denman, chief clerk; H. L. Bowers and R. L. Morgenweck, fiscal agents.

Indian Projects:

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; W. A. Meyer, chief clerk; F. H. Shiner, fiscal agent.

Flathead Project.—F. T. Crowe, project manager, St. Ignatius, Mont.; C. J. Moody, engineer; R. V. Sass, superintendent of construction; H. N. Bickel, chief clerk; J. P. Siebeneicher and J. M. Swan, fiscal agents.

Fort Peck Project.—R. M. Conner, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; G. H. Baird, chief clerk and fiscal agent.

DISTRIBUTION OF EMPLOYEES.

Employees, June, 1919.

Office or project.	Educa- tional.	Non- educa- tional.	Others.	Total United States.	Con- trac- tors.	Grand total.
Washington office.....	95	.....	6	101	.....	101
Denver office.....	72	.....	.....	72	.....	72
Field offices, district counsel.....	31	.....	.....	31	.....	31
Consulting engineers.....	20	.....	.....	20	.....	20
Arizona, Salt River ¹	11	59	150	220	.....	220
Arizona-California, Yuma.....	6	9	6	21	.....	21
California, Orland.....	.....	.....	.....	.....	.....	.....
Colorado:	.....	.....	.....	.....	.....	.....
Grand Valley.....	10	39	60	109	.....	109
Uncompahgre Valley.....	8	54	33	95	.....	95
Idaho:	.....	.....	.....	.....	.....	.....
Boise.....	25	100	432	557	20	577
King Hill.....	13	12	9	34	.....	34
Minidoka.....	20	81	35	136	.....	136
Montana:	.....	.....	.....	.....	.....	.....
Huntley.....	2	12	22	36	1	37
Milk River distribution unit.....	16	16	66	97	2	99
St. Mary storage unit.....	3	10	6	19	.....	19
Sun River.....	14	21	23	58	5	63
Montana-North Dakota, Lower Yellowstone.....	4	5	17	26	.....	26
Nebraska-Wyoming, North Platte.....	31	63	289	383	35	418
Nevada, Newlands.....	15	40	37	92	.....	92
New Mexico, Carlsbad.....	4	10	56	70	10	80
New Mexico-Texas, Rio Grande.....	38	119	598	755	21	776
North Dakota, North Dakota pumping.....	3	5	30	38	.....	38
Oregon, Umatilla.....	6	16	5	27	1	28
Oregon-California, Klamath.....	6	29	65	100	.....	100
South Dakota, Belle Fourche.....	6	30	30	66	.....	66
Utah, Strawberry Valley.....	7	14	10	31	.....	31
Washington:	.....	.....	.....	.....	.....	.....
Yakima—	.....	.....	.....	.....	.....	.....
Project office.....	14	1	.....	15	.....	15
High-line.....	8	25	1	34	.....	34
Sunnyside.....	4	28	20	52	.....	52
Tieton.....	1	18	13	32	.....	32
Storage unit.....	.....	5	.....	5	.....	5
Okanogan.....	5	10	35	50	.....	50
Wyoming, Shoshone.....	20	44	53	117	17	134
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfeet.....	4	9	12	25	.....	25
Flathead.....	25	30	151	206	.....	206
Fort Peck.....	4	4	41	49	.....	49
Riverton.....	5	33	2	40	.....	40
Total, June, 1919.....	555	951	2,313	3,819	112	3,931

¹ Operation and maintenance of project transferred to water users, Nov. 1, 1917.

WAGES.

Approximate average daily wages, common labor, 1914-1919.

State and project.	1914		1915		1916		1917		1918		1919	Increase in 5 years.
	June.	Dec.	June.	Dec.	June.	Dec.	June.	Dec.	June.	Dec.	June.	
Arizona: Salt River.....	\$2.00	\$1.75	\$1.90	\$1.90	\$2.15	\$2.15	\$2.25	\$2.60	\$3.00	\$3.00	\$3.00	\$1.00
Arizona-California: Yuma.....	2.50	2.00	2.00	2.00	2.20	2.20	2.40	2.75	3.00	3.00	3.00	1.00
California: Orland.....	2.50	2.50	2.40	2.40	2.50	2.75	2.75	2.75	3.35	3.60	3.50	1.00
Colorado:												
Grand Valley.....	2.25	2.40	2.31	2.50	2.50	2.50	2.65	3.00	3.00	3.20	3.20	.95
Uncompahgre.....	2.12	2.25	2.61	2.50	2.66	2.50	2.50	3.25	3.25	3.30	3.50	1.38
Idaho:												
Boise—												
Distribution unit.....	2.30	2.40	2.50	2.25	2.40	2.40	2.40	3.00	3.30	3.60	3.80	1.50
Storage unit.....	2.50	2.50	2.50	2.50	2.50	2.50	2.75	.....	.....	.....	3.38	.....
King Hill.....												
Mindoka—												
Distribution unit.....	2.25	2.25	2.25	2.25	2.25	2.25	3.00	3.50	3.50	3.55	3.50	1.25
Idaho-Wyoming: Storage unit (Jackson Lake).....	2.50	2.50	2.50	2.50	2.50	2.50	2.75	.....	.....	.....	.....	.....
Montana:												
Huntley.....	2.50	2.50	2.24	2.45	2.25	2.75	2.75	3.30	3.30	3.30	3.30	.80
Milk River—												
Distribution unit.....	2.50	2.65	2.60	2.70	2.90	2.90	3.00	3.20	3.30	3.60	3.58	1.08
St. Mary storage unit.....	2.50	2.50	2.40	2.56	2.50	2.72	2.86	3.00	3.60	3.60	3.71	1.21
Sun River.....	2.25	2.24	2.18	2.40	2.50	2.72	3.00	3.25	3.58	3.90	3.65	1.40
Montana-North Dakota: Lower Yellowstone.....	2.25	2.35	2.25	2.40	2.25	2.75	2.75	3.00	3.00	3.00	3.20	.95
Nebraska-Wyoming:												
North Platte—												
Interstate unit.....	2.12	2.35	2.40	2.40	2.40	2.40	2.50	2.88	3.20	3.28	3.33	1.21
Fort Laramie unit.....				2.00	2.30	2.40	2.50	3.04	3.20	3.28	.....	.....
Nevada: Newlands.....	2.20	2.50	2.50	2.50	2.50	2.50	2.75	3.50	3.75	4.06	3.68	1.48
New Mexico: Carlsbad.....	1.50	1.50	1.50	1.63	1.63	1.76	1.76	2.00	2.00	2.00	2.25	.75
New Mexico-Texas:												
Rio Grande—												
Distribution unit.....	1.25	1.25	1.50	1.50	1.58	1.60	1.75	1.75	1.75	None port.	1.65	.40
Elephant Butte storage.....												
North Dakota: North Dakota pumping.....	1.67	1.67	1.67	1.70	1.72	2.50	2.75	2.75	2.87	3.80	4.25	1.75
Oregon: Umatilla.....	2.50	2.50	2.50	2.50	2.60	2.60	2.80	3.00	3.50	4.00	4.00	1.60
Oregon-California: Klamath.....	2.48	2.48	2.48	2.48	2.40	2.60	2.72	3.80	3.60	3.60	3.88	1.40
South Dakota: Belle Fourche.....	2.24	2.48	2.48	2.50	2.53	2.50	2.80	3.00	3.25	3.65	4.00	1.75
Utah: Strawberry Valley.....	2.50	2.50	2.50	2.25	2.37	2.60	2.80	3.00	3.25	3.25	3.25	.75

	2.50	2.50	2.20	2.20	2.20	2.60	2.80	3.00	3.20	3.50	3.44	.94
Washington:												
Okanogan.....	2.50	2.50	2.20	2.20	2.20	2.60	2.80	3.00	3.20	3.50	3.44	1.80
Yakima—												1.86
Storage unit.....	2.20	2.20	2.60	2.20	2.20	2.60	3.00	2.90	3.00	4.00	4.00	1.86
Sunside unit.....	2.20	2.00	2.00	2.20	2.20	2.80	2.60	3.00	3.80	3.60	3.85	2.00
Tieona unit.....	2.00	2.20	2.20	2.20	2.20	2.40	2.75	3.00	3.30	4.00	3.60	1.20
Wyoming: Shoshone.....	2.40	2.40	2.40	2.40			2.93	3.34	3.50	3.60		
INDIAN PROJECTS.												
Blackfeet.....	2.40	2.40	2.40	2.40	2.50	2.50	2.50	2.50	3.28	3.00	3.42	1.02
Fishhead.....	2.50	2.50	2.26	2.56	2.65	2.75	2.90	3.20	3.60	4.00	4.00	1.50
Fort Peck.....	2.50	2.50	2.56	2.56	2.70	2.70	2.80	3.15	3.30	3.40	3.50	1.00
Riverton.....											4.00	
Estimated average.....	2.28	2.26	2.27	2.28	2.33	2.48	2.63	2.96	3.18	3.47	3.50	1.27

INJURIES.

Statement of injuries to employees of the United States Reclamation Service reported under the act of Sept. 7, 1916.

State and project.	Injuries reported.				Claims allowed.				Compensation paid.			
	1916-17 ¹	1918	1919*	Total.	1916-17 ¹	1918	1919*	Total.	1916-17 ¹	1918	1919*	Total.
Arizona: Salt River.....	28			28	17			17	\$2,057.38	\$140.00		\$2,197.38
Arizona-California: Yuma.....	46	35	24	105	24	15	5	44	2,608.33	3,178.18	\$347.45	6,133.96
California: Orland.....	5	3		8	3	2		5	141.36	53.35		194.71
Colorado:												
Grand Valley.....	14	10	10	34	6	2	5	13	167.62	288.29	271.10	727.01
Uncompahgre.....	18	28	4	50	11	19	3	33	406.41	1,025.73	88.90	1,523.04
District of Columbia: District of Columbia.....	1		1	2	1		1	2	21.60			21.60
Idaho:												
Boise.....	44	28	9	81	26	11	5	42	2,350.11	1,487.81	115.23	3,953.15
Minidoka.....	8	9	10	27	3	1	3	7	200.45	2.00	166.05	368.50
King Hill.....	2	13	7	22		8	4	12	823.12	268.91		1,092.03
Montana:												
Huntley.....	11	8	1	20	5	5		10	285.40	195.31		480.71
Milk River.....	7	11	8	26	3	5	3	11	94.65	279.20	282.25	656.10
St. Mary storage.....	12	6		18	8	1		9	271.14	683.98		955.12
Sun River.....	10	8		18	6	4		10	181.70	106.68		288.38
Montana-North Dakota: Lower Yellowstone.....	3	2	1	6								
Nebraska-North Dakota: Lower Yellowstone.....	11	33	26	70	7	14	3	24	457.97	1,527.57	322.24	2,307.78
Nevada: Wyoming: North Platte.....	13	16	9	38	3	7	3	13	151.37	184.45	157.78	493.60
Nevada: Newlands.....	8			8	5			5	70.87			70.87
New Mexico: Carlsbad.....	20	62	25	107	10	18	10	38	238.55	605.17	877.11	1,720.83
New Mexico-Texas: Rio Grande.....	8	3	1	12	3	2		5	626.54	511.14		1,137.68
North Dakota: North Dakota pumping.....	5	1		6	2	1		3	53.34			53.34
Oregon: Umatilla.....	7	7	2	16	6	2		8	130.57	119.07		249.64
Oregon-California: Klamath.....	7	3	1	11	4	1	1	6	450.13	11.11	19.00	569.20
South Dakota: Bellefourche.....	3	6		9	2	3		5	368.90	214.11		583.01
Utah: Strawberry Valley.....									58.76			58.76
Washington:												
Okanogan.....	1	2	4	7			1	3	153.35		24.45	177.80
Yakima.....	76	64	3	143	52	31	4	83	2,733.99	3,185.59		5,919.58
Wyoming: Shoshone.....	17	11	16	44	6	5		15	1,206.76	2,512.17	263.35	4,012.28
INDIAN PROJECTS.												
Blackfeet.....	3			3	1			1	6.67			6.67
Flathead.....	51	7	2	60	24	4	1	29	1,453.46	1,929.96	760.08	4,143.50
Fort Peck.....	1			1								
Total.....	440	375	165	980	238	163	52	453	16,775.99	19,370.68	3,993.90	40,040.57

¹ Sept. 7, 1916, to Dec. 31, 1917.

* To June 30.

ENGINEERING ARTICLES RELATING TO THE WORK OF THE SERVICE.

The following is a partial list of engineering articles relating to the work of the Reclamation Service as published in engineering and technical journals. The list is printed for the information of of engineers and others interested in the work, and is a continuation of similar lists published in previous annual reports and also printed as separates for distribution.

GENERAL ARTICLES.

Irrigation in Peru. (Reference to area possible to irrigate and Reclamation Service experts employed.) Eng. Record, July 4, 1908, vol. 58 p. 27.

Effect of alkali on Portland cement. J. Y. Jewett (from paper Am. Soc. of Testing Materials). Sun River and Shoshone projects. Eng. Record, July 25, 1908, vol. 58, pp. 105-106.

Forest and run-off relations. (News reference to cooperation of Reclamation Service.) Eng. Record, Sept. 5, 1908, vol. 58, p. 255; Sept. 19, 1908, vol. 58, p. 310.

Panama Canal organization. (Letter including reference in regard to low cost at which Reclamation Service is doing work by Government forces.) Eng. Record, Dec. 12, 1908, vol. 58, p. 680.

Irrigated area of United States. (Short news article giving area irrigable about 45,000,000 acres.) Eng. Record, Sept. 25, 1909, vol. 60, p. 354.

Bonds for Reclamation Service irrigation. (Long editorial.) Eng. Record, Oct. 9, 1919, vol. 60, p. 394.

Cost data cards, U. S. Reclamation Service. Eng. Record, Nov. 27, 1909, vol. 60, p. 598.

United States Reclamation Service. (Appreciative editorial of work which United States may well be proud of.) Eng. Record, Dec. 11, 1909, vol. 60, p. 649.

Conservation message of President Taft. (Editorial reference to difficulties of U. S. R. S.) Eng. Record, Jan 22, 1910, vol. 61, p. 89. Text of message on national irrigation and bond loan, pp. 94-95.

Proposed corps of U. S. civil engineers. (Editorial mention of "demoralization" of the Reclamation Service.) Eng. Record, Apr. 23, 1910, vol. 61, pp. 94-95.

Review of 6th edition of H. M. Wilson's Irrigation Engineering revised. Practice of U. S. R. S. utilized as standard authority. Eng. Record, Apr. 23, 1910, vol. 61, p. 567.

Reconnaissance method of determining the volume of reservoir sites. (Tables of U. S. R. S. reservoirs and others.) Illus. and maps. H. W. Sheley, Eng. Record, Apr. 30, 1910, vol. 61, pp. 581-584.

Hydraulic and Excavation Tables. Brief review of 1910 edition. Eng. Record, June 11, 1910, vol. 61, p. 769.

State aid to irrigation farmers. Address by Elwood Mead at Irrigation Conference, Denver, Apr. 9, 1914.) Eng. News, June 4, 1914, vol. 71, p. 1231.

Government aid to irrigation in United States and Australia. Elwood Mead, Eng. News, July 30, 1914, vol. 72, p. 234.

Irrigation in America and Victoria; lessons to be learned. Elwood Mead, Eng. Record, Aug. 22, 1914, vol. 70, p. 220. (Editorial statement in Eng. Record, Sept. 5, 1914, p. 259.)

Portrait of Elwood Mead, who is on his way from Australia to serve as a member of Secretary of Interior Lane's supreme court of review of costs and revaluation of the federation irrigation projects. The Irrigation Age, June, 1915, p. 236.

Australia sorry to lose Elwood Mead. The Irrigation Age, June, 1915, vol. 30, pp. 244 and 250.

Reform in land settlement method. Elwood Mead. Reprint from Proceedings of National Conference of Social Work. 3 pp. pamphlet. No. 152.

Land settlement and rural credits. Elwood Mead. Statement of the need of an investigation. Mimeographed statement of 5 pages.

The rural credit system needed in western development. Address by Elwood Mead before National Conference on Marketing and Rural Credit, Chicago, Ill., Nov. 30, 1915. Reprinted from the University of California Chronicle, vol. 18, No. 1. 16 pp.

A tenant farmer and land monopoly. Elwood Mead. Reprint from the Proceedings of Annual Meeting of National Conference of Social Work. 315 Plymouth Court, Chicago, Ill. 5 pp. pamphlet, 153.

Farming his own. California is the first State of the Union to follow the lead of other countries in extending aid to settlers upon the land. Elwood Mead, Sunset Magazine, pp. 26, 27, 67 to 70.

Why the United States should invest in farmers. Illus. Elwood Mead, Irrigation Age, Dec. 1915, vol. 31, p. 21.

Government aid and direction in land settlement. Address by Dr. Elwood Mead at 1916 session Colorado Farmer's Congress, Fort Collins, Colo. Printed by U. S. National Bank, Denver, Colo. 14 pp.

Report of the commission in land colonization and rural credits of the State of California. Elwood Mead, chairman. Nov. 29, 1916. 120 pp. Calif. State Printing Office, Sacramento, Calif.

National colonization bill. Statement of Mr. Elwood Mead, Committee on Labor House of Representatives, Dec. 15, 1916, and Dec. 20, 1916. Hearings on H. R. 11329, pp. 85 to 120.

Government assistant to bring irrigated lands quickly under cultivation. Address by Dr. Elwood Mead at Washington Irrigation Institute, Yakima, Wash., Dec. 5, 1917. Published in the 5th annual proceedings, pp. 35-46.

What our Government ought to be and ought to do. Elwood Mead. From Metropolitan Magazine, Jan. 1917, pp. 16, 60-61.

State aid and direction in land settlement. Address by Dr. Elwood Mead at the American Economic Association, Philadelphia, Pa. Dec. 27, 1917. (Neostyled, 36 pp.)

Pumping on irrigation projects. J. M. Gaylord, Reclamation Record, Feb. 1918, vol. 9, pp. 75-79.

Farms for returned soldiers, outline of plan for development of arid, swamp, and other unused lands, including letter to the President by Secretary Lane, May 31, 1918, with What other nations are doing. 24 pp.

Report of the State land settlement board of the State of California, Elwood Mead, chairman. June 30, 1918. 30 pp., with map. Calif. State Printing Office, Sacramento, Calif.

Reclamation of arid lands our insurance against food shortage. Speech by Hon. Nicholas J. Sinnott in House of Representatives, May 23, 1918. Reclamation Record, July, 1918, vol. 9, pp. 308-309.

Returning soldiers may develop country's resources. (Secretary Lane's letter to President Wilson.) Reclamation Record, July, 1918, vol. 9, pp. 306-308.

Proposed plan to secure funds for the reclamation of arid and swamp lands. Speech by Hon. Addison T. Smith, House of Representatives, July 15, 1918. Reclamation Record, Aug., 1918, vol. 9, pp. 354-356.

Providing homes for returning soldiers. Extracts of letters from Senators, Congressmen, and leading newspapers supporting the plan, and also letter from Secretary Lane to Chairman Sherley, of Appropriations Committee, stating what is being done in foreign countries. Reclamation Record, Sept. 1918, vol. 9, pp. 403-409.

Irrigation, drainage, and cut-over land investigation, illustrations of engineers in charge and map of respective districts. H. A. Brown, editor. Reclamation Record, Sept. 1918, vol. 9, pp. 402-403.

Swamp and cut-over lands investigation. Engineers chosen for three districts. Elwood Mead aids. Eng. News-Record, Sept. 5, 1918, vol. 81, p. 469.

Home-making by the Interior Department. F. K. Lane, Peoples Monthly, Oct., 1918.

Organization chart of the Reclamation Service, Sept. 1, 1918 (including investigations of swamp and cut-over lands). A. P. Davis, Chief Engineer, Reclamation Record, Oct., 1918, vol. 9, p. 504.

Farm allotments and farm laborers' allotments in the Durham State land settlement, Elwood Mead, chairman, Oct., 1918. 7 pp. with map. Calif. State Printing Office, Sacramento, Calif.

Measurement of water to farms, methods, limitations of accuracy, its importance to the water user, and project interests. J. S. Longwell, Reclamation Record, Oct., 1918, vol. 9, pp. 480-485.

Pumping from wells. illus. J. M. Gaylord, Reclamation Record, Oct., 1918, vol. 9, pp. 485-487.

Necessity teaches proper use of irrigation water. (Newsitem.) Eng. News-Record. Oct. 3, 1918, vol. 81, p. 609.

Homes for returning soldiers and sailors. Report by H. L. Myers, Committee on Public Lands. 8 pp. Oct. 7, 1918. Senate Report No. 580, 65th Cong., 2d sess.

Work and homes for the returned fighting men. F. K. Lane, Orchard and Farm, Oct. 15, 1918.

Putting two and two together. F. K. Lane, Independent, Oct. 26, 1918.

Demobilization—Industrial and military. F. K. Lane, Printers' Ink, Oct. 31, 1918, vol. 105, pp. 3-6, 104-112. (Editorial, p. 114, Secretary Lane's sane optimism.)

Summary of soldier settlements in English-speaking countries. Elwood Mead, Nov., 1918, 28 pp. Govt. Printing Office.

Reclamation of swamp, overflow, and cut-over lands. F. W. Hanna, Reclamation Record, Nov., 1918, vol. 9, pp. 507-509.

Tables showing quantities of water used on projects of the United States Reclamation Service, its monthly distribution, and other data for the years 1912 to 1917, inclusive. E. A. Moritz, Reclamation Record, Nov., 1918, vol. 9, pp. 532-539.

Graduated slope gauge and movable stilling box. Illus. W. G. Steward, Reclamation Record, Nov., 1918, vol. 9, pp. 538-540.

Farms for returned soldiers. Stanley F. Morse, Manufacturers Record, Nov. 7, 1918, vol. 74, p. 86.

A million farms for soldiers. Uncle Sam plans to give the boys up-to-date homesteads. Illus. John R. McMahon, The Country Gentlemen, Nov. 9, 1918, vol. 83, pp. 7-8, 28.

Farms for returned soldiers. Illus. Franklin K. Lane, Scientific American, Nov. 9, 1918, vol. 119, pp. 372-373.

Irrigation pump geared to automobile engine. (From October Reclamation Record.) J. M. Gaylord, Eng. & Cont., Nov. 13, 1918, vol. 50, p. 473.

Some experience with large-capacity reservoir outlets. Illus. J. M. Gaylord, Eng. News-Record, Nov. 21, 1918, vol. 81, pp. 945-950.

When the boys get back from France. Emerson Hough. Saturday Evening Post, Nov. 30, 1918, pp. 12, 13, 58, 61, 64.

Annual report of the Secretary of the Interior. F. K. Lane, Dec., 1918. 31 pp.

Soldier settlement plans of foreign countries. Table from data in Dr. Mead's pamphlet "Summary of soldier settlements in English-speaking countries." Reclamation Record, Dec., 1918, vol. 9, pp. 580-581.

Beginning of planned rural development in the United States. Address by Elwood Mead, at Southern Land Congress, Savannah, Ga., Nov. 11, 1918. Reclamation Record, Dec., 1918, vol. 9, pp. 554-557.

Draft of bill proposed for cooperation between the States and the United States to provide employment and homes for soldiers, sailors, and marines, under which the States shall furnish the lands and the United States the funds; with an alternative proposition so that the States may participate further in furnishing funds and also in supervising the improvement and settlement of the lands. F. K. Lane, Dec. 2, 1918. 4 pp.

Rural institutions, its scope and purpose. A new division in the College of Agriculture, University of California. Elwood Mead. Introduction by Thos. F. Hunt. 23 pp.

How one English-speaking country is providing rural homes for returning soldiers. Interview with Wm. Cattanach, chairman State Rivers and Water Supply Comm. Victoria, Dec. 2, 1918. 7 pp. (neostyled).

Highway improvement and land reclamation as means for providing for returned soldiers. Address by F. K. Lane at Council of National Defense, Sept. 17. Eng. & Cont., Dec. 4, 1918, vol. 50, pp. 522-523, 529.

President backs land reclamation program. (Short editorial p. 1009, news reference to plan p. 1046.) Eng. News-Record, Dec. 5, 1918, vol. 81, pp. 1009 and 1046.

Developing irrigated land with selected settlers. Illus. Eng. News-Record, Dec. 5, 1918, vol. 81, pp. 1014-1018. (Editorial reference, p. 1013.)

Engineering council resolutions on land reclamation. News item. Eng. News-Record, Dec. 26, 1918, vol. 81, p. 1199.

President Wilson urges support of Secretary Lane's plan. (Extract of President's message to Congress, Dec. 2, 1918.) Reclamation Record, Jan., 1919, vol. 10, p. 2.

The returning soldier (Extract of Secretary Lane's annual report.) Reclamation Record, Jan., 1919, vol. 10, pp. 3-8.

Soldier-settlement laws. (Draft of proposed State cooperative legislation for soldier settlements.) Reclamation Record, Jan., 1919, pp. 8-11.

Land for returning soldiers. F. W. Wilson, DuPont Magazine, Jan., 1919, vol. 10, p. 8.

Reclaiming lands for the returned soldier. F. K. Lane, Jour. of Electricity, Jan. 1, 1919, vol. 42, p. 11.

Will the soldier farm? Literary Digest, Jan. 4, 1919, vol. 60, pp. 15-16.

Would appropriate \$100,000,000 for land reclamation. (News item.) Eng. News-Record, Jan. 16, 1919, vol. 82, p. 162.

Bills call for power surveys. Eng. News-Record, Feb. 20, 1919, vol. 82, p. 401.

Spillway capacities required for reservoirs in Western United States. J. T. Whistler, Eng. News-Record, July 3, 1919, vol. 82, pp. 28-32.

ARIZONA, SALT RIVER PROJECT.

Government cement mill at Roosevelt completed grinding Apr. 28, 1910, saving about \$650,000. (Short article with data.) Eng. Record, May 7, 1910, vol. 61, p. 608.

Floods damage Arizona canal. (News item.) Eng. News-Record, Aug. 29, 1918, vol. 81, p. 424.

ARIZONA-CALIFORNIA, YUMA PROJECT.

Laguna dam subjected to flood of 139,000 second-feet. (Short account with data.) Eng. Record, July 10, 1909, vol. 60, p. 45.

Concrete chute in an irrigation canal. Illus. M. Nikolitch, Eng. Record, Apr. 23, 1910, vol. 61, p. 557.

Conditions on the lower Colorado River. Eng. Record, July 2, 1910, vol. 62, p. 12.

Progress on proposed connection with Laguna Dam. Proposed vote of irrigation district. (News item.) Eng. News-Record, Aug. 29, 1918, vol. 81, p. 424.

Contract signed for Laguna Dam connection. (Short news item All-American Canal.) Eng. News-Record, Nov. 14, 1918, vol. 81, p. 914.

A commission to study the Colorado and save Imperial Valley. W. W. Schlecht, Eng. News-Record, Feb. 13, 1919, vol. 82, pp. 315-316.

Colorado River flood control by storage. Illus. E. C. La Rue, Eng. News-Record, Mar. 6, 1919, pp. 456-461.

Controlling and using Colorado River floods. (News item.) Eng. News-Record, Mar. 6, 1919, 82, p. 453.

Imperial Valley active on All-American Canal. (Short news item.) Eng. News-Record, June 26, 1919, vol. 82, p. 1282.

CALIFORNIA, ORLAND PROJECT.

Feed canal over divide saves irrigators. Short article on effect of construction of the East Park feed canal. Eng. News-Record, Nov. 14, 1918, vol. 81, p. 872.

Auxiliary outlet gate relieves main gates of dam. Illus. R. C. E. Weber, Eng. News-Record, Mar. 27, 1919, vol. 82, pp. 624-625.

COLORADO, GRAND VALLEY PROJECT.

Triangulation survey, Grand Valley project, with costs. (Short.) Eng. Record, June 5, 1909, vol. 59, p. 722.

The construction of the Grand River roller crest dam. O. T. Reedy, Reclamation Record, Aug. 1919, vol. 10, pp. 374-378.

COLORADO, UNCOMPAHGRE VALLEY PROJECT.

Gunnison tunnel holed through July 6, 1909. (Short news item with data.) Eng. Record, July 17, 1909, vol. 60, p. 74.

Gunnison tunnel opening by President Taft. (Long news article with data.) Eng. Record, Oct. 2, 1909, vol. 60, p. 367.

IDAHO, BOISE PROJECT.

High-pressure gates in dams for waterworks and irrigation reviewed. Illus. D. W. Cole, Eng. News-Record, Nov. 14, 1918, vol. 81, pp. 880-884.

Cost of ditches for reclaiming Idaho lands (with tables). D. W. Cole, Eng. News-Record, Apr. 3, 1919, vol. 82, p. 678.

IDAHO, MINIDOKA PROJECT.

Raising water by undershot wheels. Illus. (Letter describing 6 wooden wheels on Snake River one-half mile below Minidoka Dam.) Eng. Record, Dec. 25, 1909, vol. 60, p. 730.

Electric heating as a profitable load. Illus. Barry Dibble, Jour. of Electricity, Feb. 1, 1919, vol. 42, pp. 102-105.

MONTANA, SUN RIVER PROJECT.

Porous canal banks blanketed by hydraulic sluicing. R. B. Stevens, Eng. News-Record, Nov. 14, 1918, vol. 81, p. 911.

NEBRASKA-WYOMING, NORTH PLATTE PROJECT.

Cost of an earth dike at Whalen, Wyo. (From Reclamation Record.) Eng. Record, Mar. 20, 1909, vol. 59, p. 329.

NEVADA, NEWLANDS PROJECT.

Tractors rough-level lands before sale to settlers. Illus. (From Reclamation Record, Mar., 1918.) F. N. Cronholm, Eng. News-Record, Sept. 5, 1918, vol. 81, pp. 438-439.

NEW MEXICO, CARLSBAD PROJECT.

Water supply of Carlsbad, N. Mex. (for \$1.25 per acre-foot). (Short news item.) Eng. Record, July 23, 1910, vol. 62, p. 111.

Weaving wire bags to hold riprap on earth embankment. Illus. L. E. Foster, Eng. News-Record, Feb. 6, 1919, vol. 82, p. 301.

NEW MEXICO-TEXAS, RIO GRANDE PROJECT.

Standard bridge abutments on canal projects. Photo and diagrams. D. C. Willett, Eng. News-Record, Apr. 17, 1919, vol. 82, pp. 777-778.

Reinforced concrete culverts under irrigation canal. Illus. D. C. Willett, Eng. News-Record, May 8, 1919, vol. 82, p. 919.

OREGON-CALIFORNIA, KLAMATH PROJECT.

Irrigation of submerged lands. (Short news item on drainage Klamath Lakes and on Clear Lake Dam.) Eng. Record, Jan. 29, 1910, vol. 61, p. 144.

UTAH, STRAWBERRY VALLEY PROJECT.

Spanish Fork, Utah, to be furnished electric current by Reclamation Service. (Short news item, giving rate and data.) Eng. Record, Oct. 23, 1909, vol. 60, p. 469.

Turnout in high velocity canal gives good service. Illus. (Use of underdrop on Strawberry Valley canals.) J. L. Lytel, Eng. News-Record, Sept. 19, 1918, vol. 81, pp. 545-546.

WASHINGTON, YAKIMA PROJECT.

Hydraulic rams on Sunnyside unit. (Short news item giving data.) Eng. Record, Dec. 19, 1908, vol. 58, p. 701.

Flood damage checked by storage reservoirs. (From June Reclamation Record.) R. K. Tiffany, Eng. News-Record, Aug. 29, 1918, vol. 81, p. 410.

Control of algae by copper sulphate. R. K. Tiffany, Reclamation Record, Nov. 1918, vol. 9, p. 531.

Enlargement of the Yakima-Tieton main canal. Illus. G. C. Finley, Eng. News-Record, June 26, 1919, vol. 82, pp. 1255-1258.

WYOMING, SHOSHONE PROJECT.

Another record, completion of the Shoshone Dam, Sunday, Jan. 16, 1910. (Short editorial with data.) Eng. Record, Jan. 22, 1910, vol. 61, p. 91.

Design of Shoshone Dam. (Letter by J. L. Campbell.) Eng. Record, Aug. 13, 1910, vol. 62, p. 196.

GENERAL INDEX.

	Page.
Accounting terminology.....	74
Administrative organization.....	544
Allotment and gross costs.....	51
American Falls reservoir.....	414
Anderson Island diversion.....	426
Annual reports.....	2
Appendix.....	459
Assets, liabilities, reverses, and capital.....	44
Augustura project.....	421
Bedrock reservoir site.....	403
Belle Fourche project.....	305
Big Piney-La Barge project.....	427
Blackfeet (Indian) project.....	434
Boise project.....	131
Extension.....	413
Blue Mountain Canyon power site.....	410
Bluff reservoir site.....	404
Bonneville project.....	427
Carlsbad project.....	251
Carson Valley project.....	417
Cash transactions.....	43
Castle Peak project.....	423
Cement testing.....	38, 510
Chicken Creek reservoir.....	421
Church Buttes project.....	425
Coal Creek power site.....	411
Collections.....	67
Colorado reconnaissance.....	389
Colorado River basin.....	391
Construction cost by features.....	44
Results, summary of.....	18
Contemplated work, estimated cost of.....	46
Contracts, principal current.....	502
Cost of investing the Reclamation fund.....	49
Crop results.....	23
Statistics.....	536
Cross Mountain Canyon power site.....	410
Denver office financial statement.....	429
Devils River project.....	423
Dewey reservoir site.....	403
Dixon (Putah Creek) project.....	386
Dolores project.....	389
Drainage.....	27
Investigations.....	428
Drouth conditions.....	7
Electrical and mechanical engineering.....	37
Employees, distribution of.....	547
Engineering articles.....	551
Data for project on completion.....	524
Farmers' Ditch & Canal Co.....	416
Finances, general.....	42
Financial data, general.....	47
Flaming Gorge reservoir power site.....	409
Flaming Gorge reservoir site.....	403
Flat Willow project.....	415
Flathead (Indian) project.....	441

	Page.
Flood regulation, Colorado River.....	405
Fort Peck (Indian) project.....	449
Freight, passenger, and express transportation.....	40
Gore Canyon power site.....	411
Grand Canyon power site.....	412
Grand River basin.....	397
Grand Valley project.....	106
Green River basin.....	396
Green River basin projects.....	425
Guernsey reservoir.....	416
Hillcrest unit.....	413
Huntley project.....	164
Imperial Valley, All-American Canal project.....	384
Indian projects.....	434
Injuries.....	550
Investigations of new projects.....	8
Investment of the United States in projects.....	58
Iron Canyon project.....	385
Irrigable and irrigated acreage.....	9
Irrigation farming, advantage of.....	9
Progress.....	10
Island Park reservoir.....	414
Jackson Lake enlargement.....	163
Juniper reservoir site.....	403
King Hill project.....	143
Klamath project.....	295
Extensions.....	419
Kremmling reservoir site.....	403
La Barge diversion.....	426
La Rue, E. F., water power, Colorado River basin.....	408
Langell Valley unit.....	420
Large Seedskaadee project.....	426
Law decisions.....	472
Legal division.....	40
Legislation.....	459
Letter of transmittal.....	5
Lincoln and Dawson County project.....	416
Litigations.....	476
Little Colorado River basin.....	397
Lower Powder River project.....	419
Lower Rio Grande project.....	421
Lower Yellowstone project.....	196
Marble Canyon power site.....	411
Materials and supplies, purchase of.....	39
Middle Rio Grande project.....	417
Milk River project.....	172
Minidoka project.....	149
Extension.....	413
Minnie Maud power site.....	410
Missoula-Hasson project.....	415
Montezuma project.....	387
Mountain Home project.....	415
Newlands project.....	223
North Dakota pumping project.....	272
North Platte project.....	207
Okanogan project.....	330
Opal project.....	426
Operating costs and revenues.....	45
Orchard Mesa extension.....	388
Oregon Basin project.....	425
Orland project.....	97
Extension.....	386
Ouray reservoir site.....	403
Owyhee project.....	418
Paradise Verde project.....	383
Personnel.....	41

	Page.
Power contracts.....	33
Development.....	29
Plants operated.....	30
Undeveloped.....	36
Primary projects.....	77
Project operations.....	13
Pumping plants operated.....	31
Putah Creek project.....	386
Pyramid Lake extension.....	417
Rattlesnake power site.....	411
Receipts by States.....	50
By years.....	50
Repayment contracts.....	45
Rights and property, purchase of.....	492
Rio Grande Dam appropriation.....	67
Rio Grande project.....	261
Riverton (Indian) project.....	455
St. Mary storage.....	172
Salt River project.....	77
San Juan River basin.....	397
San Luis Valley project.....	389
Secondary projects and proposed extensions.....	383
Seepage and drainage.....	13
Sentinal project.....	383
Settlement.....	20
Shoshone project.....	368
Small Seedskaadee project.....	426
Split Mountain Canyon power site.....	410
Storage unit, Yakima project.....	345
Strawberry Valley project.....	315
Sun River project.....	184
Sunnyside unit, Yakima project.....	346
Swallow Canyon power site.....	409
Texan reconnoissance.....	423
Tieton unit, Yakima project.....	351
Tornilla-Fort Hancock extension.....	423
Truckee-Carson project (<i>see</i> Newlands)	
Tule Lake lands.....	419
Uinta Basin.....	397
Umatilla project.....	281
Extensions.....	420
Uncompahgre project.....	116
Unit bids and contract prices.....	512
Utah reconnoissance.....	424
Wages.....	548
Warner's Ranch project.....	386
Warren Act contracts.....	11
Washington office financial statement.....	429
Waistler, John T., summary of report on Colorado River basin.....	391
Wyoming cooperative work.....	424
Yakima project.....	342
Extensions.....	424
Yampa and White River basins.....	397
Yuma-Mesa extension.....	384
Yuma project.....	84

UNIVERSITY OF MICHIGAN

3 9015 05710 7339

THE
STATE
LIBRARY

